MITSUBISHI ELECTRIC

700 series

INVERTER FR-A700 INSTRUCTION MANUAL (BASIC)

FR-A720-0.4K to 90K
FR-A740-0.4K to 500K

Thank you for choosing this Mitsubishi Inverter.
This Instruction Manual (Basic) is intended for users who "just want to run the inverter".

CONTENTS

To obtain the Instruction Manual (Applied)

If you are going to utilize functions and performance, refer to the *Instruction Manual (Applied)* [IB-0600226ENG].
The *Instruction Manual (Applied)* is separately available from where you purchased the inverter or your Mitsubishi sales representative.

The PDF version of this manual is also available for download at "MELFANS Web," the Mitsubishi Electric FA network service on the world wide web (URL: http://www.MitsubishiElectric.co.jp/melfansweb)

This Instruction Manual (Basic) provides handling information and precautions for use of the equipment.
Please forward this Instruction Manual (Basic) to the end user.

This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect the inverter until you have read through this Instruction Manual (Basic) and appended documents carefully and can use the equipment correctly. Do not use the inverter until you have a full knowledge of the equipment, safety information and instructions. In this Instruction Manual (Basic), the safety instruction levels are classified into "WARNING" and "CAUTION".

⚠WARNING Incorrect handling may cause hazardous conditions, resulting in death or severe injury.

⚠CAUTION Incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause only material damage.

The **⚠CAUTION** level may even lead to a serious consequence according to conditions. Both instruction levels must be followed because these are important to personal safety.

1. Electric Shock Prevention

⚠ WARNING

- While power is ON or when the inverter is running, do not open the front cover. Otherwise you may get an electric shock.
- Do not run the inverter with the front cover or wiring cover removed.
  Otherwise you may access the exposed high-voltage terminals or the charging part of the circuitry and get an electric shock.
- Even if power is off, do not remove the front cover except for wiring or periodic inspection. You may accidentally touch the charged inverter circuits and get an electric shock.
- Before wiring, inspection or switching EMC filter ON/OFF connector, power must be switched OFF. To confirm that, LED indication of the operation panel must be checked. (It must be OFF.) Any person who is involved in wiring, inspection or switching EMC filter ON/OFF connector shall wait for at least 10 minutes after the power supply has been switched OFF and check that there are no residual voltage using a tester or the like. The capacitor is charged with high voltage for some time after power OFF, and it is dangerous.
- This inverter must be earthed (grounded). Earthing (grounding) must conform to the requirements of national and local safety regulations and electrical code (NEC section 250, IEC 536 class 1 and other applicable standards).
  A neutral-point earthed (grounded) power supply for 400V class inverter in compliance with EN standard must be used.
- Any person who is involved in wiring or inspection of this equipment shall be fully competent to do the work.
- The inverter must be installed before wiring. Otherwise you may get an electric shock or be injured.
- Setting dial and key operations must be performed with dry hands to prevent an electric shock. Otherwise you may get an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise you may get an electric shock.
- Do not replace the cooling fan while power is on. It is dangerous to replace the cooling fan while power is on.
- Do not touch the printed circuit board or handle the cables with wet hands. Otherwise you may get an electric shock.
- When measuring the main circuit capacitor capacity (*Pr. 259 Main circuit capacitor life measuring* = "1"), the DC voltage is applied to the motor for 1s at powering off. Never touch the motor terminal, etc. right after powering off to prevent an electric shock.

2. Fire Prevention

⚠ CAUTION

- Inverter must be installed on a nonflammable wall without holes (so that nobody touches the inverter heatsink on the rear side, etc.). Mounting it to or near flammable material can cause a fire.
- If the inverter has become faulty, the inverter power must be switched OFF. A continuous flow of large current could cause a fire.
- When using a brake resistor, a sequence that will turn OFF power when a fault signal is output must be configured.
  Otherwise the brake resistor may overheat due to damage of the brake transistor and possibly cause a fire.
- Do not connect a resistor directly to the DC terminals P/+ and N/-. Doing so could cause a fire.

3. Injury Prevention

⚠ CAUTION

- The voltage applied to each terminal must be the ones specified in the Instruction Manual. Otherwise burst, damage, etc. may occur.
- The cables must be connected to the correct terminals. Otherwise burst, damage, etc. may occur.
- Polarity must be correct. Otherwise burst, damage, etc. may occur.
- While power is ON or for some time after power-OFF, do not touch the inverter since the inverter will be extremely hot. Doing so can cause burns.

4. Additional Instructions

Also the following points must be noted to prevent an accidental failure, injury, electric shock, etc.

(1) Transportation and installation

⚠ CAUTION

- The product must be transported in correct method that corresponds to the weight. Failure to do so may lead to injuries.
- Do not stack the boxes containing inverters higher than the number recommended.
- The product must be installed to the position where withstands the weight of the product according to the information in the Instruction Manual.
- Do not install or operate the inverter if it is damaged or has parts missing. This can result in breakdowns.
- When carrying the inverter, do not hold it by the front cover or setting dial; it may fall off or fail.
- Do not stand or rest heavy objects on the product.
- The inverter mounting orientation must be correct.
- Foreign conductive objects must be prevented from entering the inverter. That includes screws and metal fragments or other flammable substance such as oil.
- As the inverter is a precision instrument, do not drop or subject it to impact.
- The inverter must be used under the following environment: Otherwise the inverter may be damaged.

Environment	Surrounding air temperature	-10°C to +50°C (non-freezing)
	Ambient humidity	90% RH or less (non-condensing)
	Storage temperature	-20°C to +65°C *1
	Atmosphere	Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)
	Altitude, vibration	Maximum 1000m above sea level for standard operation. 5.9m/s^2 or less *2 at 10 to 55Hz (directions of X, Y, Z axes)

*1 Temperature applicable for a short time, e.g. in transit.
*2 2.9m/s^2 or less for the 160K or higher.

(2) Wiring ⚠ CAUTION

- Do not install a power factor correction capacitor, surge suppressor or capacitor type filter on the inverter output side. These devices on the inverter output side may be overheated or burn out.
- The connection orientation of the output cables U, V, W to the motor affects the rotation direction of the motor.

(3) Test operation and adjustment

⚠ CAUTION

- Before starting operation, each parameter must be confirmed and adjusted. A failure to do so may cause some machines to make unexpected motions.

(4) Operation ⚠ WARNING

- Any person must stay away from the equipment when the retry function is set as it will restart suddenly after trip.
- Since pressing STOP RESET key may not stop output depending on the function setting status, separate circuit and switch that make an emergency stop (power OFF, mechanical brake operation for emergency stop, etc.) must be provided.
- OFF status of the start signal must be confirmed before resetting the inverter fault. Resetting inverter alarm with the start signal ON restarts the motor suddenly.
- The inverter must be used for three-phase induction motors. Connection of any other electrical equipment to the inverter output may damage the equipment.
- Performing pre-excitation (LX signal and X13 signal) under torque control (Real sensorless vector control) may start the motor running at a low speed even when the start command (STF or STR) is not input. The motor may also run at a low speed when the speed limit value = 0 with a start command input. It must be confirmed that the motor running will not cause any safety problem before performing pre-excitation.
- Do not modify the equipment.
- Do not perform parts removal which is not instructed in this manual. Doing so may lead to fault or damage of the inverter.

⚠ CAUTION

- The electronic thermal relay function does not guarantee protection of the motor from overheating. It is recommended to install both an external thermal and PTC thermistor for overheat protection.
- Do not use a magnetic contactor on the inverter input for frequent starting/stopping of the inverter. Otherwise the life of the inverter decreases.
- The effect of electromagnetic interference must be reduced by using a noise filter or by other means. Otherwise nearby electronic equipment may be affected.
- Appropriate measures must be taken to suppress harmonics. Otherwise power supply harmonics from the inverter may heat/ damage the power factor correction capacitor and generator.
- When driving a 400V class motor by the inverter, the motor must be an insulation-enhanced motor or measures must be taken to suppress surge voltage. Surge voltage attributable to the wiring constants may occur at the motor terminals, deteriorating the insulation of the motor.
- When parameter clear or all parameter clear is performed, the required parameters must be set again before starting operations because all parameters return to the initial value.
- The inverter can be easily set for high-speed operation. Before changing its setting, the performances of the motor and machine must be fully examined.
- Stop status cannot be hold by the inverter's brake function. In addition to the inverter's brake function, a holding device must be installed to ensure safety.
- Before running an inverter which had been stored for a long period, inspection and test operation must be performed.
- For prevention of damage due to static electricity, nearby metal must be touched before touching this product to eliminate static electricity from your body.

(5) Emergency stop ⚠ CAUTION

- A safety backup such as an emergency brake must be provided to prevent hazardous condition to the machine and equipment in case of inverter failure.
- When the breaker on the inverter input side trips, the wiring must be checked for fault (short circuit), and internal parts of the inverter for a damage, etc. The cause of the trip must be identified and removed before turning ON the power of the breaker.
- When any protective function is activated, appropriate corrective action must be taken, and the inverter must be reset before resuming operation.

(6) Maintenance, inspection and parts replacement

⚠ CAUTION

- Do not carry out a megger (insulation resistance) test on the control circuit of the inverter. It will cause a failure.

(7) Disposing of the inverter

⚠ CAUTION

- The inverter must be treated as industrial waste.

General instructions

Many of the diagrams and drawings in this Instruction Manual (Basic) show the inverter without a cover or partially open for explanation. Never operate the inverter in this manner. The cover must be always reinstalled and the instruction in this Instruction Manual (Basic) must be followed when operating the inverter.

— CONTENTS —

<Abbreviations>
DU: Operation panel (FR-DU07)
PU: Operation panel(FR-DU07) and parameter unit (FR-PU04, FR-PU07)
Inverter: Mitsubishi inverter FR-A700 series
FR-A700: Mitsubishi inverter FR-A700 series
Pr.: Parameter Number (Number assigned to function)
PU operation: Operation using the PU (FR-DU07/FR-PU04/FR-PU07).
External operation: Operation using the control circuit signals
Combined operation: Combined operation using the PU (FR-DU07/FR-PU04/FR-PU07) and external operation
Standard motor: SF-JR
Constant-torque motor: SF-HRCA
Vector dedicated motor: SF-V5RU

The following marks are used to indicate the controls as below.
(Parameters without any mark are valid for all control)

...V/F control

...Advanced magnetic flux vector control

...Real sensorless vector control

...vector control

<Trademarks>

1 OUTLINE

1.1 Product checking and parts identification

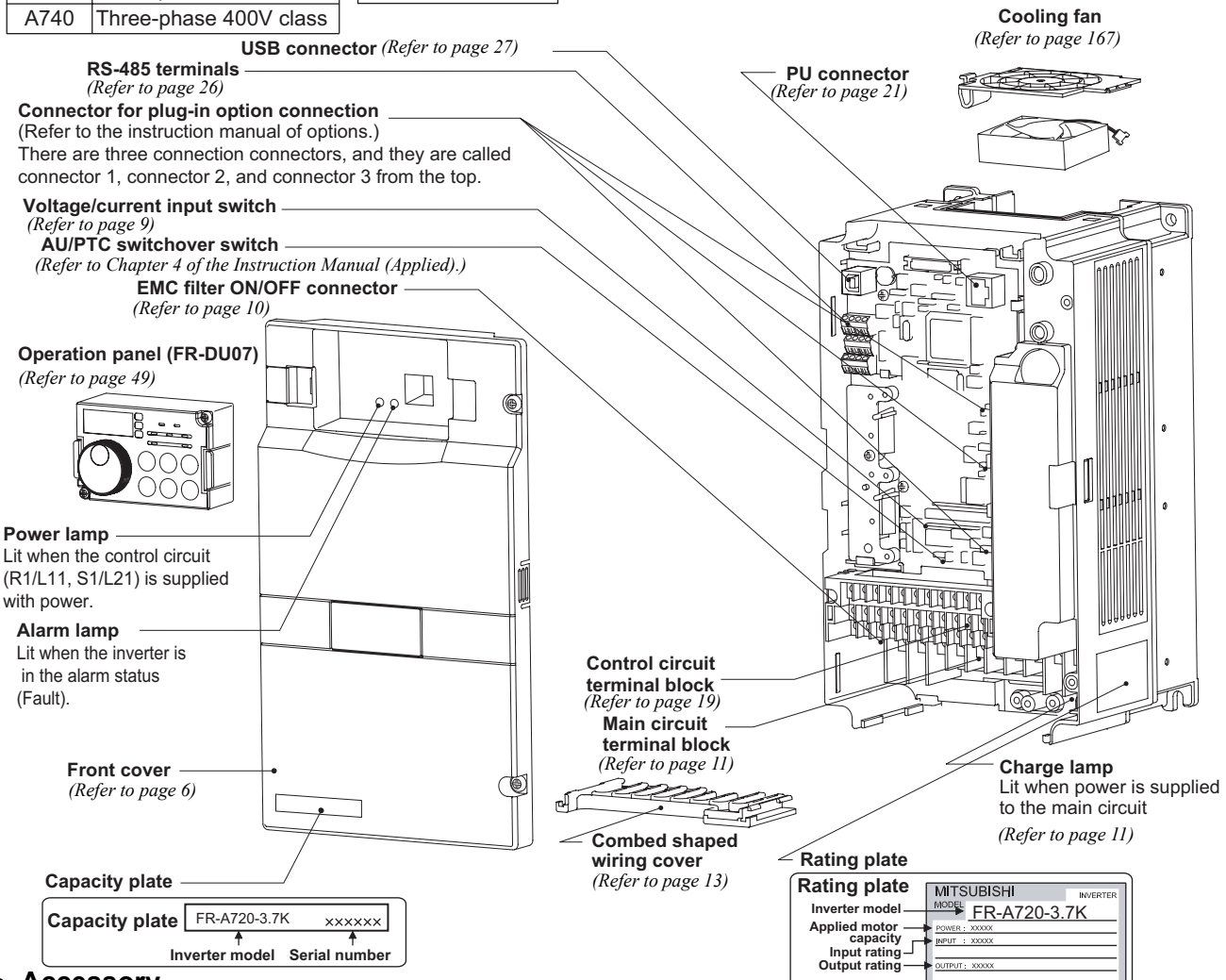
Unpack the inverter and check the capacity plate on the front cover and the rating plate on the inverter side face to ensure that the product agrees with your order and the inverter is intact.

- **Inverter Model**

FR - A720 - 3.7 K

Symbol	Voltage Class
A720	Three-phase 200V class
A740	Three-phase 400V class

Represents inverter capacity (kW)



- **Accessory**
  - **Fan cover fixing screws (22K or lower) (*Refer to page 196*)**
    These screws are necessary for compliance with the EU Directive.

Capacity		Screw Size (mm)	Quantity
200V	1.5K to 3.7K	M3 × 35	1
	5.5K to 11K	M4 × 40	2
	15K to 22K	M4 × 50	1
400V	2.2K, 3.7K	M3 × 35	1
	5.5K to 15K	M4 × 40	2
	18.5K, 22K	M4 × 50	1

  - **DC reactor supplied (75K or higher)**
  - **Eyebolt for hanging the inverter (30K to 280K)**

Capacity	Eyebolt Size	Quantity
30K	M8	2
37K to 132K	M10	2
160K to 280K	M12	2

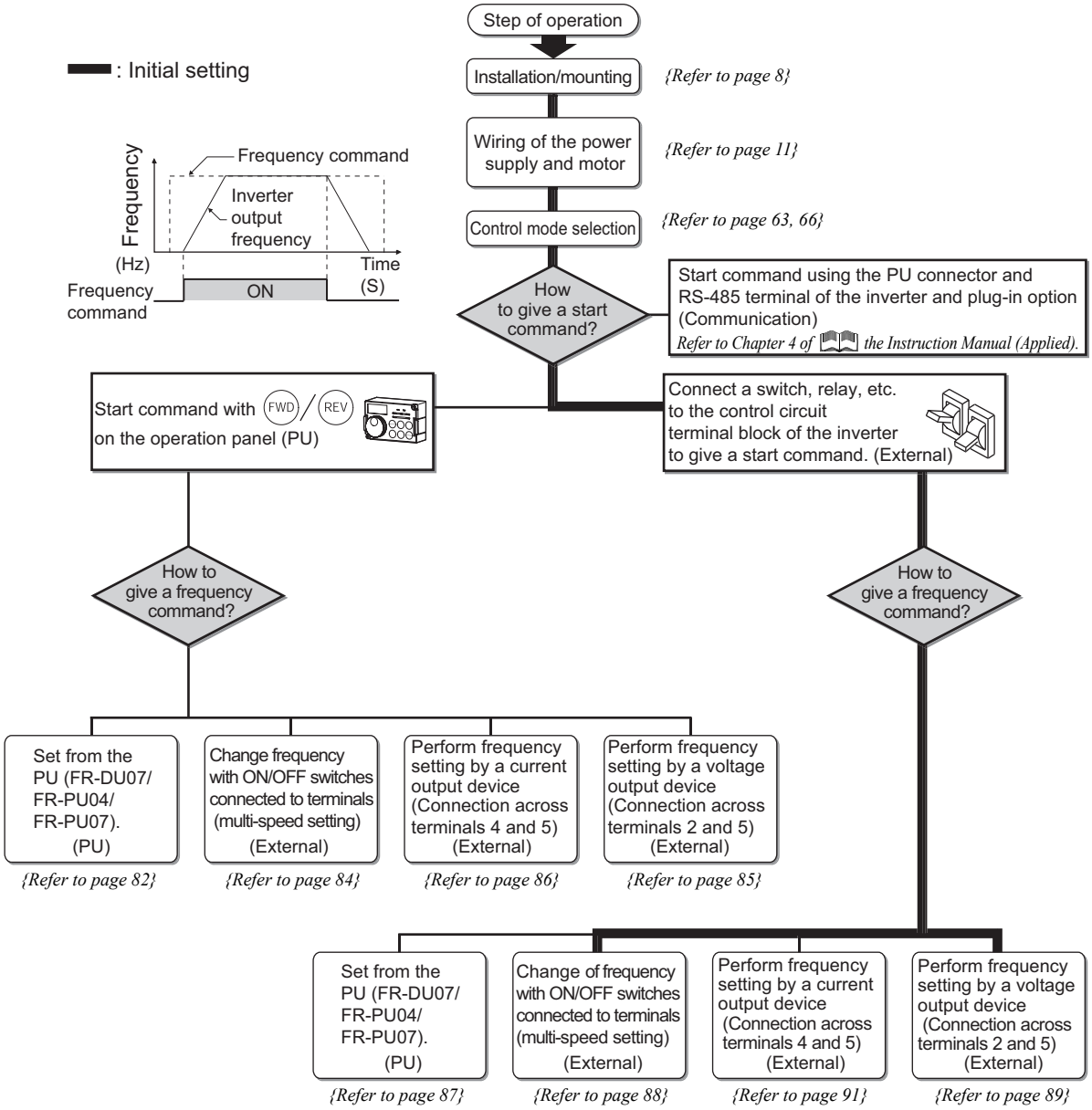
REMARKS

- For removal and reinstallation of covers, *refer to page 6*.
- For how to find the SERIAL number, *refer to page 192*.

Harmonic suppression guideline
All models of general-purpose inverters used by specific consumers are covered by "Harmonic suppression guideline for consumers who receive high voltage or special high voltage". (*For further details, refer to Chapter 3 of the Instruction Manual (Applied).*)

1.2 Step of operation

The inverter needs frequency command and start command. Frequency command (set frequency) determines the rotation speed of the motor. Turning ON the start command starts the motor to rotate.
Refer to the flow chart below to perform setting.



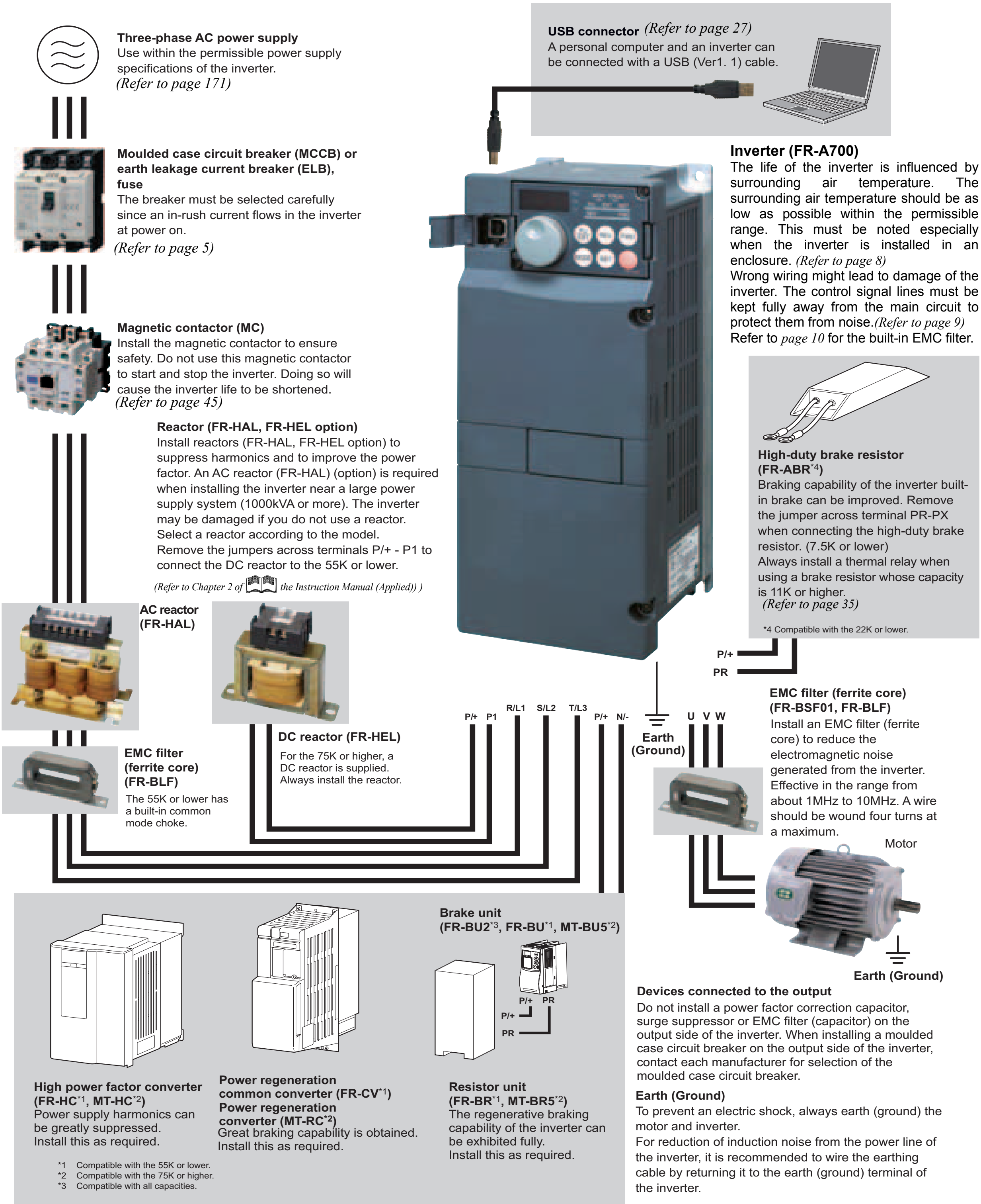
CAUTION

Check the following items before powering on the inverter.

- Check that the inverter is installed correctly in a correct place. *(Refer to page 8)*
- Check that wiring is correct. *(Refer to page 9)*
- Check that no load is connected to the motor.

- *When protecting the motor from overheat by the inverter, set Pr.9 Electronic thermal O/L relay (Refer to page 58)*
- *When the rated frequency of the motor is 50Hz, set Pr.3 Base frequency (Refer to page 58)*

2 INSTALLATION AND WIRING



: Install these options as required.

CAUTION

- Do not install a power factor correction capacitor, surge suppressor or EMC filter (capacitor) on the inverter output side. This will cause the inverter to trip or the capacitor, and surge suppressor to be damaged. If any of the above devices are connected, immediately remove them.
- Electromagnetic wave interference
  The input/output (main circuit) of the inverter includes high frequency components, which may interfere with the communication devices (such as AM radios) used near the inverter. In this case, set the EMC filter valid to minimize interference.
  (Refer to Chapter 2 of the Instruction Manual (Applied).)
- Refer to the instruction manual of each option and peripheral devices for details of peripheral devices.

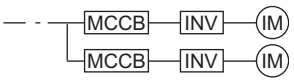
2.1 Peripheral devices

Check the inverter model of the inverter you purchased. Appropriate peripheral devices must be selected according to the capacity. Refer to the following list and prepare appropriate peripheral devices:

200V class

Motor Output (kW)	Applicable Inverter Model	Moulded Case Circuit Breaker (MCCB) *1 or Earth Leakage Circuit Breaker (ELB) (NF or NV type)		Input Side Magnetic Contactor*2	
		Power factor improving (AC or DC) reactor		Power factor improving (AC or DC) reactor	
		without	with	without	with
0.4	FR-A720-0.4K	5A	5A	S-N10	S-N10
0.75	FR-A720-0.75K	10A	10A	S-N10	S-N10
1.5	FR-A720-1.5K	15A	15A	S-N10	S-N10
2.2	FR-A720-2.2K	20A	15A	S-N10	S-N10
3.7	FR-A720-3.7K	30A	30A	S-N20, S-N21	S-N10
5.5	FR-A720-5.5K	50A	40A	S-N25	S-N20, S-N21
7.5	FR-A720-7.5K	60A	50A	S-N25	S-N25
11	FR-A720-11K	75A	75A	S-N35	S-N35
15	FR-A720-15K	125A	100A	S-N50	S-N50
18.5	FR-A720-18.5K	150A	125A	S-N65	S-N50
22	FR-A720-22K	175A	150A	S-N80	S-N65
30	FR-A720-30K	225A	175A	S-N95	S-N80
37	FR-A720-37K	250A	225A	S-N150	S-N125
45	FR-A720-45K	300A	300A	S-N180	S-N150
55	FR-A720-55K	400A	350A	S-N220	S-N180
75	FR-A720-75K	—	400A	—	S-N300
90	FR-A720-90K	—	400A	—	S-N300

*1 Select the MCCB according to the power supply capacity. Install one MCCB per inverter.
For installation in the United States, Class RK5, Class J, Class CC, Class L, Class T or any faster acting fuses or UL 489 Molded Case Circuit Breaker (MCCB) must be provided, in accordance with the National Electrical Code and any applicable local codes.
For installation in Canada, Class RK5, Class J, Class CC, Class L, Class T or any faster acting fuses or UL 489 Molded Case Circuit Breaker (MCCB) must be provided, in accordance with the Canada Electrical Code and any applicable provincial codes. *(Refer to page 193.)*



*2 Magnetic contactor is selected based on the AC-1 class. The electrical durability of magnetic contactor is 500,000 times. When the magnetic contactor is used for emergency stop during motor driving, the electrical durability is 25 times.
When using the MC for emergency stop during motor driving or using on the motor side during commercial-power supply operation, select the MC with class AC-3 rated current for the motor rated current.

CAUTION

- When the inverter capacity is larger than the motor capacity, select an MCCB and a magnetic contactor according to the inverter model and cable and reactor according to the motor output.
- When the breaker on the inverter primary side trips, check for the wiring fault (short circuit), damage to internal parts of the inverter, etc. Identify the cause of the trip, then remove the cause and power on the breaker.

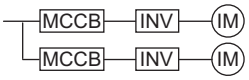
REMARKS

- Motor Output (kW) in the above table indicates values when using the Mitsubishi 4-pole standard motor with power supply voltage of 200VAC 50Hz.

400V class

Motor Output (kW)	Applicable Inverter Model	Moulded Case Circuit Breaker (MCCB) *1 or Earth Leakage Circuit Breaker (ELB) (NF or NV type)		Input Side Magnetic Contactor*2	
		Power factor improving (AC or DC) reactor		Power factor improving (AC or DC) reactor	
		without	with	without	with
0.4	FR-A740-0.4K	5A	5A	S-N10	S-N10
0.75	FR-A740-0.75K	5A	5A	S-N10	S-N10
1.5	FR-A740-1.5K	10A	10A	S-N10	S-N10
2.2	FR-A740-2.2K	10A	10A	S-N10	S-N10
3.7	FR-A740-3.7K	20A	15A	S-N10	S-N10
5.5	FR-A740-5.5K	30A	20A	S-N20, S-N21	S-N11, S-N12
7.5	FR-A740-7.5K	30A	30A	S-N20, S-N21	S-N20, S-N21
11	FR-A740-11K	50A	40A	S-N20, S-N21	S-N20, S-N21
15	FR-A740-15K	60A	50A	S-N25	S-N20, S-N21
18.5	FR-A740-18.5K	75A	60A	S-N25	S-N25
22	FR-A740-22K	100A	75A	S-N35	S-N25
30	FR-A740-30K	125A	100A	S-N50	S-N50
37	FR-A740-37K	150A	125A	S-N65	S-N50
45	FR-A740-45K	175A	150A	S-N80	S-N65
55	FR-A740-55K	200A	175A	S-N80	S-N80
75	FR-A740-75K	—	225A	—	S-N95
90	FR-A740-90K	—	225A	—	S-N150
110	FR-A740-110K	—	225A	—	S-N180
132	FR-A740-132K	—	400A	—	S-N220
160	FR-A740-160K	—	400A	—	S-N300
185	FR-A740-185K	—	400A	—	S-N300
220	FR-A740-220K	—	500A	—	S-N400
250	FR-A740-250K	—	600A	—	S-N600
280	FR-A740-280K	—	600A	—	S-N600
315	FR-A740-315K	—	700A	—	S-N600
355	FR-A740-355K	—	800A	—	S-N600
400	FR-A740-400K	—	900A	—	S-N800
450	FR-A740-450K	—	1000A	—	1000A Rated product
500	FR-A740-500K	—	1200A	—	1000A Rated product

*1 Select the MCCB according to the power supply capacity. Install one MCCB per inverter.
For installation in the United States, Class RK5, Class J, Class CC, Class L, Class T or any faster acting fuses or UL 489 Molded Case Circuit Breaker (MCCB) must be provided, in accordance with the National Electrical Code and any applicable local codes.
For installation in Canada, Class RK5, Class J, Class CC, Class L, Class T or any faster acting fuses or UL 489 Molded Case Circuit Breaker (MCCB) must be provided, in accordance with the Canada Electrical Code and any applicable provincial codes. *(Refer to page 193.)*



*2 Magnetic contactor is selected based on the AC-1 class. The electrical durability of magnetic contactor is 500,000 times. When the magnetic contactor is used for emergency stop during motor driving, the electrical durability is 25 times.
When using the MC for emergency stop during motor driving or using on the motor side during commercial-power supply operation, select the MC with class AC-3 rated current for the motor rated current.

CAUTION

- When the inverter capacity is larger than the motor capacity, select an MCCB and a magnetic contactor according to the inverter model and cable and reactor according to the motor output.
- When the breaker on the inverter primary side trips, check for the wiring fault (short circuit), damage to internal parts of the inverter, etc. Identify the cause of the trip, then remove the cause and power on the breaker.

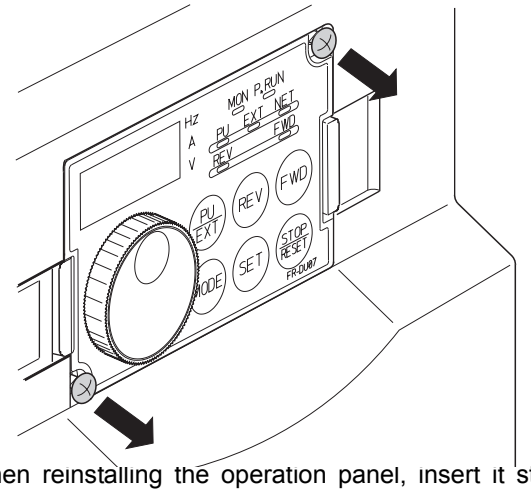
REMARKS

- Motor Output (kW) in the above table indicates values when using the Mitsubishi 4-pole standard motor with power supply voltage of 400VAC 50Hz.

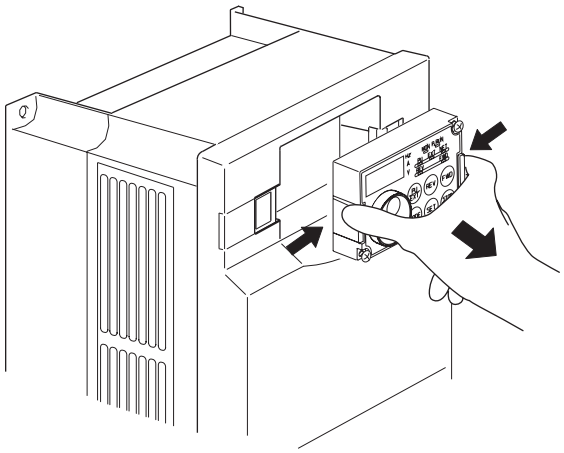
2.2 Method of removal and reinstallation of the front cover

•Removal of the operation panel

1) Loosen the two screws on the operation panel. (These screws cannot be removed.)



2) Push the left and right hooks of the operation panel and pull the operation panel toward you to remove.



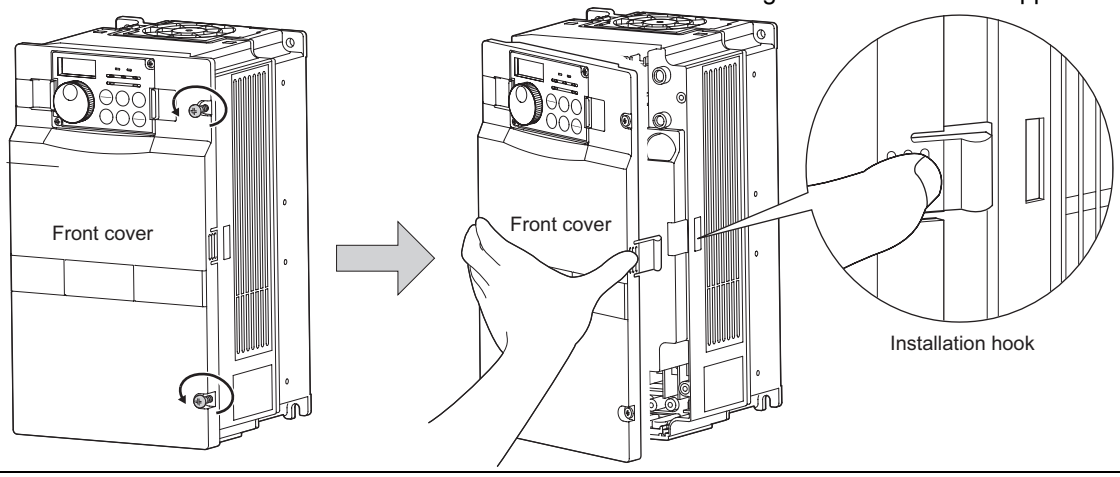
When reinstalling the operation panel, insert it straight to reinstall securely and tighten the fixed screws of the operation panel.

FR-A720-0.4K to 22K, FR-A740-0.4K to 22K

•Removal

1) Loosen the installation screws of the front cover.

2) Pull the front cover toward you to remove by pushing an installation hook using left fixed hooks as supports.

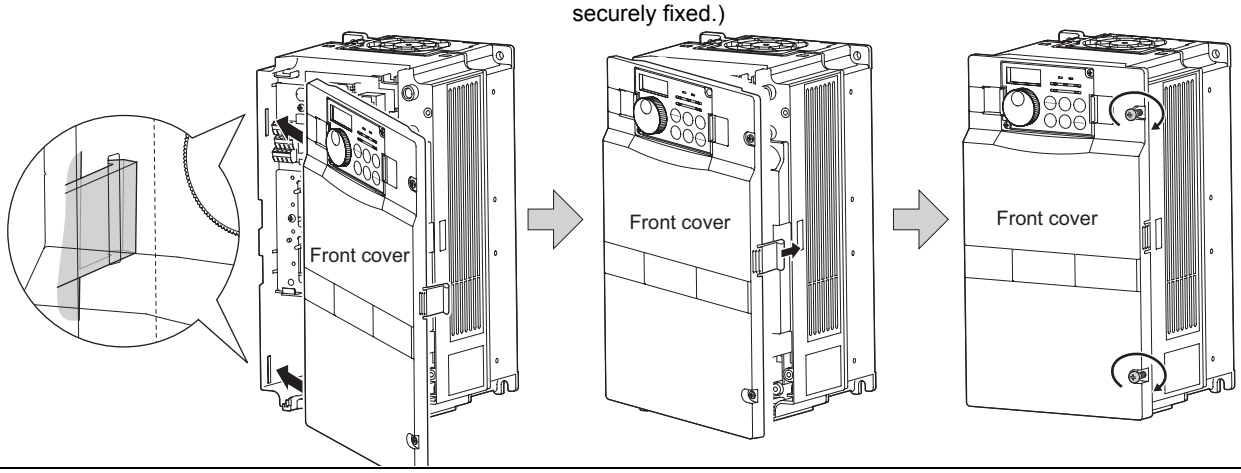


•Reinstallation

1) Insert the two fixed hooks on the left side of the front cover into the sockets of the inverter.

2) Using the fixed hooks as supports, securely press the front cover against the inverter. (Although installation can be done with the operation panel mounted, make sure that a connector is securely fixed.)

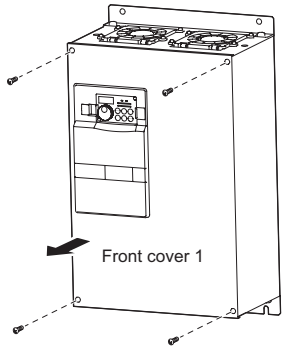
3) Tighten the installation screws and fix the front cover.



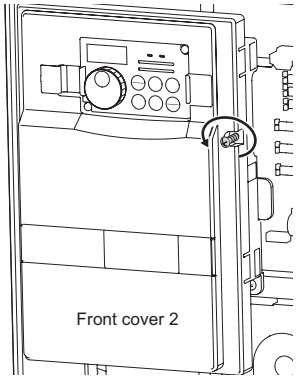
FR-A720-30K or higher, FR-A740-30K or higher

•Removal

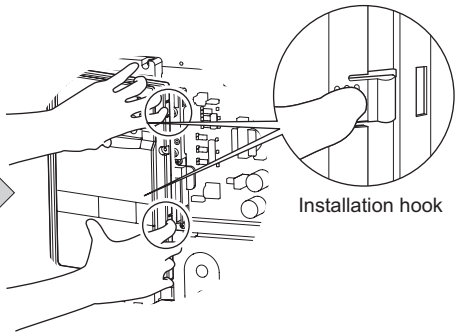
1) Remove installation screws on the front cover 1 to remove the front cover 1.



2) Loosen the installation screws of the front cover 2.



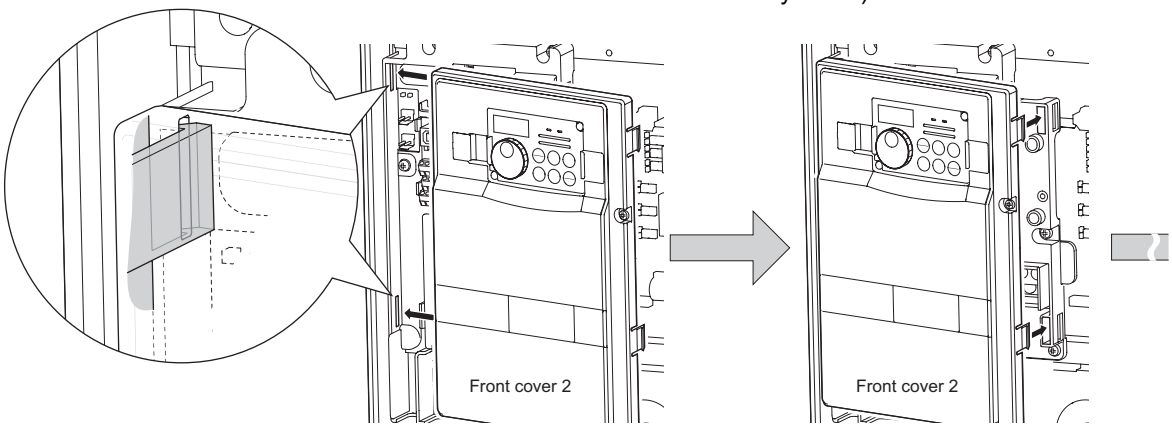
3) Pull the front cover 2 toward you to remove by pushing an installation hook on the right side using left fixed hooks as supports.



•Reinstallation

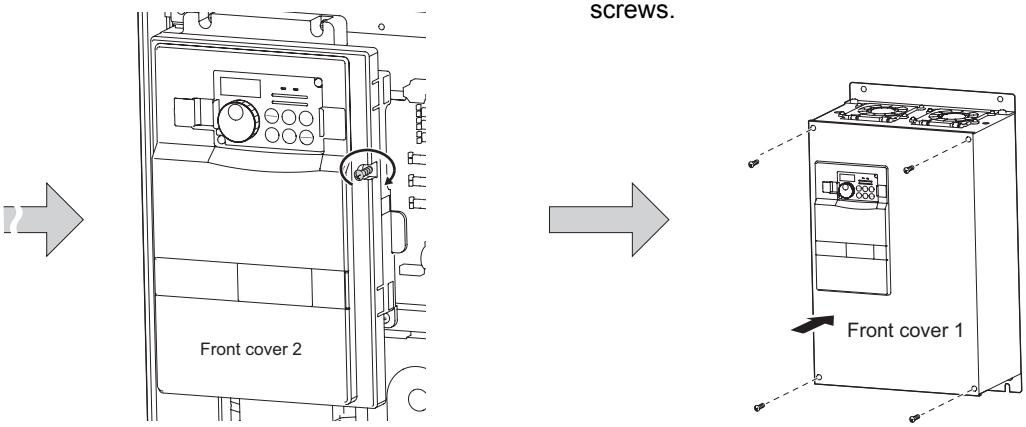
1) Insert the two fixed hooks on the left side of the front cover 2 into the sockets of the inverter.

2) Using the fixed hooks as supports, securely press the front cover 2 against the inverter.
(Although installation can be done with the operation panel mounted, make sure that a connector is securely fixed.)



3) Fix the front cover 2 with the installation screws.

4) Fix the front cover 1 with the installation screws.



REMARKS

· For the FR-A720-55K and the FR-A740-160K or higher, the front cover 1 is separated into two parts.

CAUTION

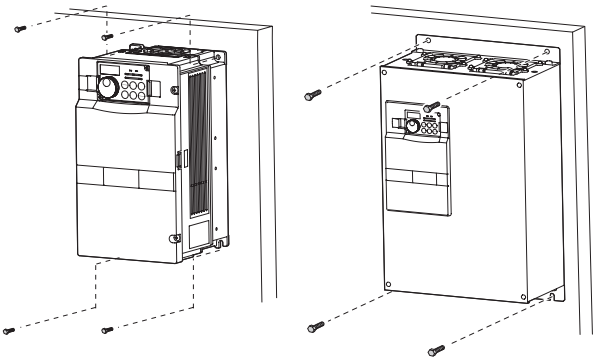
1. Fully make sure that the front cover has been reinstalled securely. Always tighten the installation screws of the front cover.
2. The same serial number is printed on the capacity plate of the front cover and the rating plate of the inverter. Before reinstalling the front cover, check the serial numbers to ensure that the cover removed is reinstalled to the inverter from where it was removed.

2.3 Installation of the inverter and instructions

• Installation of the Inverter

Installation on the enclosure

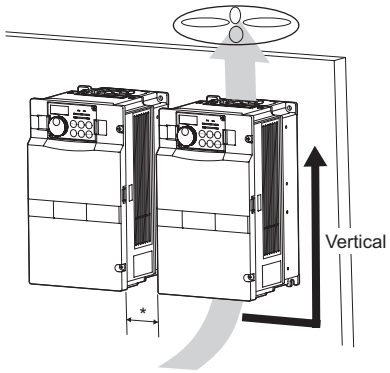
0.4K to 22K **30K or higher**



Fix six positions for the FR-A740-160K to 355K and fix eight positions for the FR-A740-400K to 500K.

CAUTION

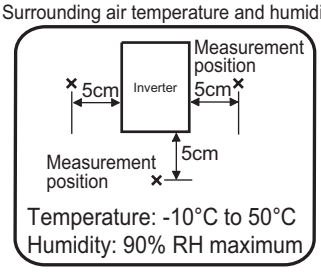
- When encasing multiple inverters, install them in parallel as a cooling measure.
- Install the inverter vertically.



* Refer to the clearance below.

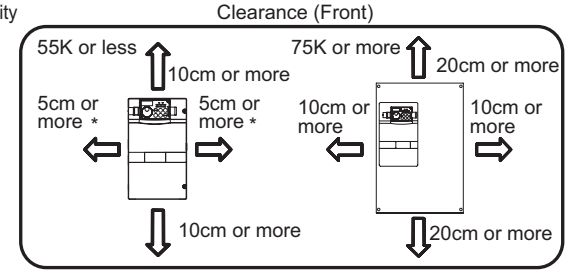
• Install the inverter under the following conditions.

Surrounding air temperature and humidity



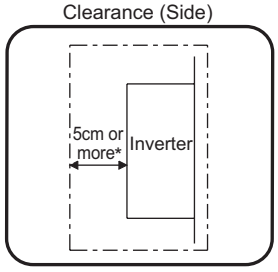
Leave enough clearance and take cooling measures.

Clearance (Front)



*1cm or more for 3.7K or lower

Clearance (Side)

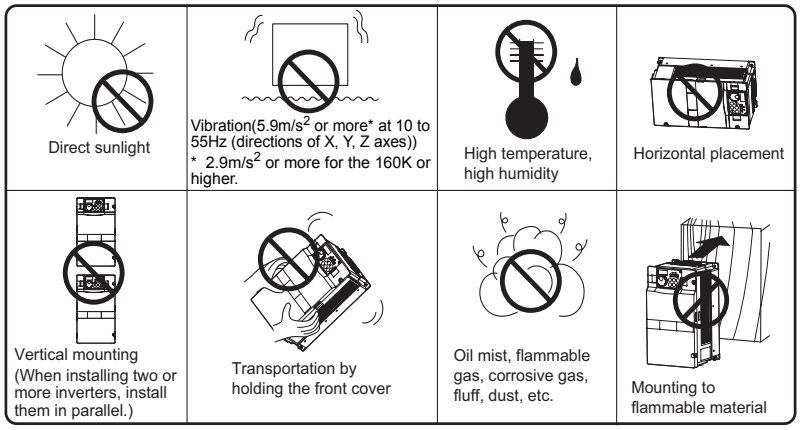


*1cm or more for 3.7K or lower

REMARKS

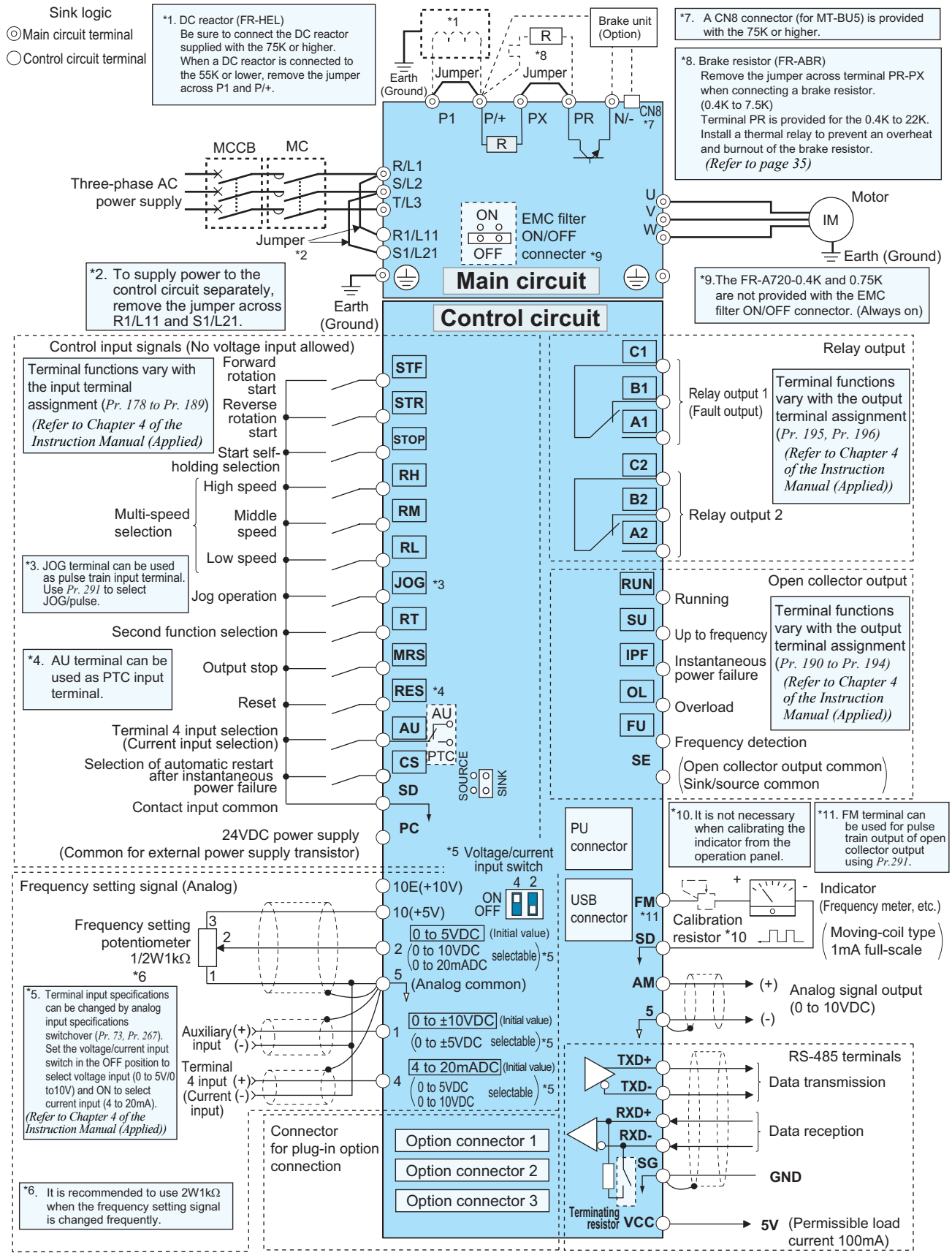
For replacing the cooling fan of the FR-A740-160K or higher, 30cm of space is necessary in front of the inverter.
Refer to *page 167* for fan replacement.

• The inverter consists of precision mechanical and electronic parts. Never install or handle it in any of the following conditions as doing so could cause an operation fault or failure.



2.4 Wiring

2.4.1 Terminal connection diagram

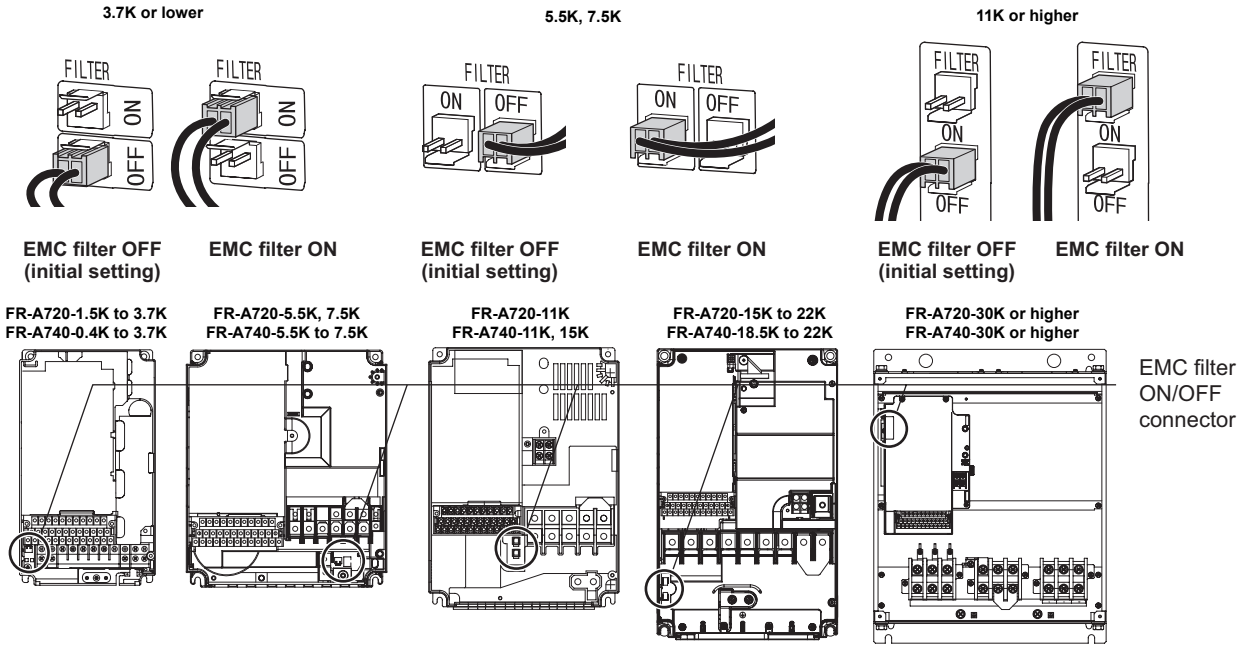


CAUTION

- To prevent a malfunction due to noise, keep the signal cables more than 10cm away from the power cables. Also separate the main circuit wire of the input side and the output side.
- After wiring, wire offcuts must not be left in the inverter.Wire offcuts can cause an alarm, failure or malfunction. Always keep the inverter clean. When drilling mounting holes in an enclosure etc., take care not to allow chips and other foreign matter to enter the inverter.
- Set the voltage/current input switch correctly. Different setting may cause a fault, failure or malfunction.

2.4.2 EMC filter

This inverter is equipped with a built-in EMC filter (capacitive filter) and common mode choke.
Effective for reduction of air-propagated noise on the input side of the inverter.
The EMC filter is factory-set to disable (OFF).
To enable it, fit the EMC filter ON/OFF connector to the ON position.
The input side common mode choke, built-in the 55K or lower inverter, is always valid regardless of on/off of the EMC filter on/off connector.

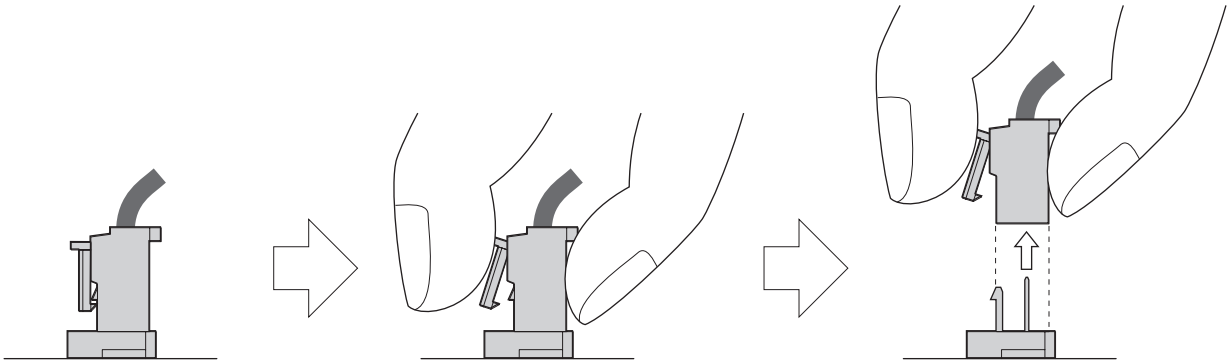


The FR-A720-0.4K and 0.75K are not provided with the EMC filter ON/OFF connector. (The EMC filter is always valid.)

<How to disconnect the connector>

(1) Before removing a front cover, check to make sure that the indication of the inverter operation panel is OFF, wait for at least 10 minutes after the power supply has been switched OFF, and check that there are no residual voltage using a tester or the like. (*Refer to page 6.*)

(2) When disconnecting the connector, push the fixing tab and pull the connector straight without pulling the cable or forcibly pulling the connector with the tab fixed. When installing the connector, also engage the fixing tab securely. If it is difficult to disconnect the connector, use a pair of long-nose pliers, etc.



CAUTION

- Fit the connector to either ON or OFF.
- Enabling (turning on) the EMC filter increases leakage current. *(Refer to Chapter 3 of the Instruction Manual (Applied))*

⚠ WARNING

⚠ While power is ON or when the inverter is running, do not open the front cover. Otherwise you may get an electric shock.

2.4.3 Specification of main circuit terminal

Terminal Symbol	Terminal Name	Description	Refer to page
R/L1, S/L2, T/L3	**AC power input**	Connect to the commercial power supply. Keep these terminals open when using the high power factor converter (FR-HC and MT-HC) or power regeneration common converter (FR-CV).	—
U, V, W	**Inverter output**	Connect a three-phase squirrel-cage motor.	—
R1/L11, S1/L21	**Power supply for control circuit**	Connected to the AC power supply terminals R/L1 and S/L2. To retain the fault display and fault output or when using the high power factor converter (FR-HC and MT-HC) or power regeneration common converter (FR-CV), remove the jumpers from terminals R/L1-R1/L11 and S/L2-S1/L21 and apply external power to these terminals. The power capacity necessary when separate power is supplied from R1/L11 and S1/L21 differs according to the inverter capacity.	17
P/+, PR	**Brake resistor connection (22K or lower)**	Remove the jumper from terminals PR-PX (7.5K or lower) and connect an optional brake resistor (FR-ABR) across terminals P/+-PR. For the 22K or lower, connecting the resistor further provides regenerative braking power.	35
P/+, N/-	**Brake unit connection**	Connect the brake unit (FR-BU2, FR-BU, BU and MT-BU5), power regeneration common converter (FR-CV), power regeneration converter (MT-RC), high power factor converter (FR-HC and MT-HC) or DC power supply (under the DC feeding mode).	37
P/+, P1	**DC reactor connection**	For the 55K or lower, remove the jumper across terminals P/+ - P1 and connect the DC reactor. (As a DC reactor is supplied with the 75K or higher as standard, be sure to connect the DC reactor.) Keep the jumper across P/+ and P1 attached when a DC reactor is not connected.	44
PR, PX	**Built-in brake circuit connection**	When the jumper is connected across terminals PX-PR (initial status), the built-in brake circuit is valid. (Provided for the 7.5K or lower.)	—
⏚	**Earth (Ground)**	For earthing (grounding) the inverter chassis. Must be earthed (grounded).	16

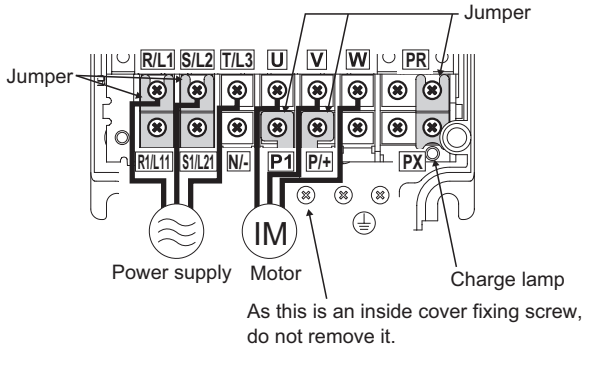
	11K or lower	15K	18.5K or higher
200V class	60VA	80VA	80VA
400V class	60VA	60VA	80VA

CAUTION

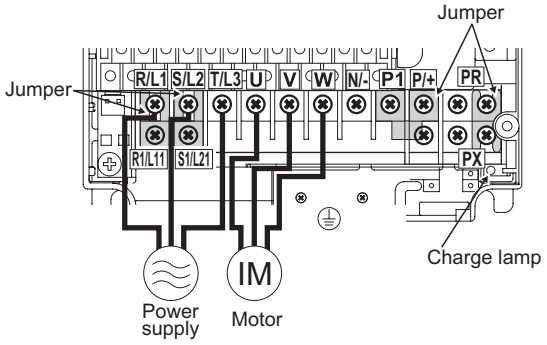
- When connecting a dedicated brake resistor (FR-ABR) and brake unit (FR-BU2, FR-BU, BU) remove jumpers across terminals PR-PX (7.5K or lower). For details, refer to *page 35*.

2.4.4 Terminal arrangement of the main circuit terminal, power supply and the motor wiring.

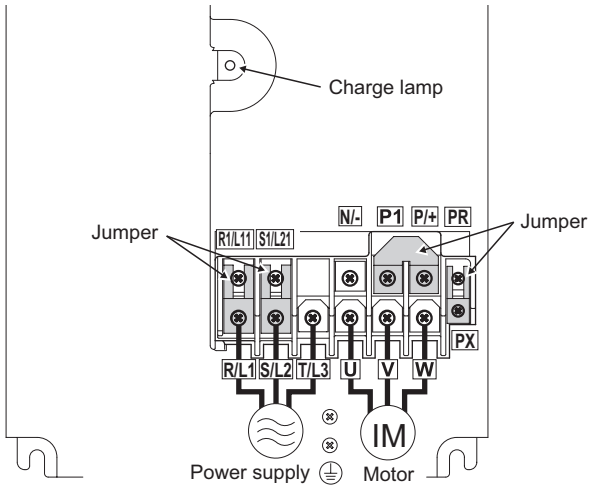
FR-A720-0.4K, 0.75K



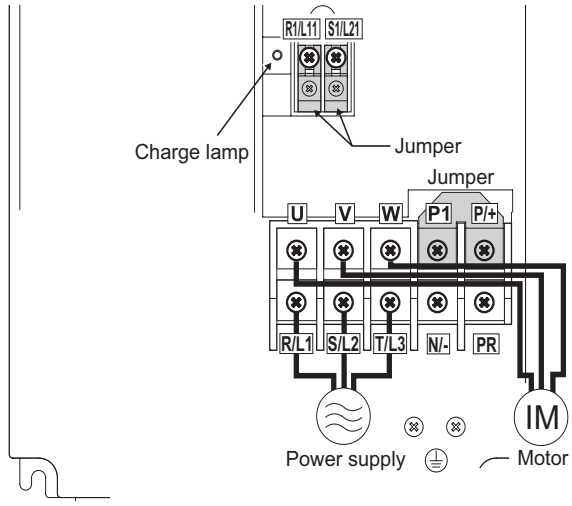
FR-A720-1.5K to 3.7K
FR-A740-0.4K to 3.7K



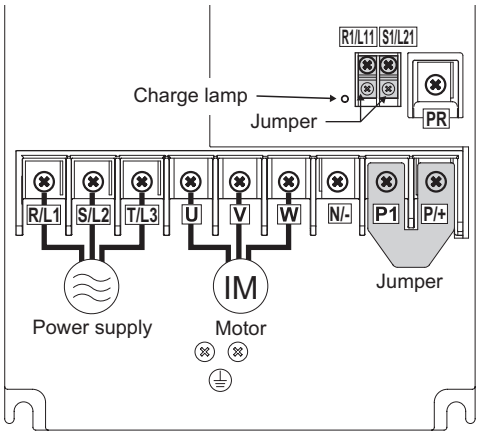
FR-A720-5.5K, 7.5K
FR-A740-5.5K, 7.5K



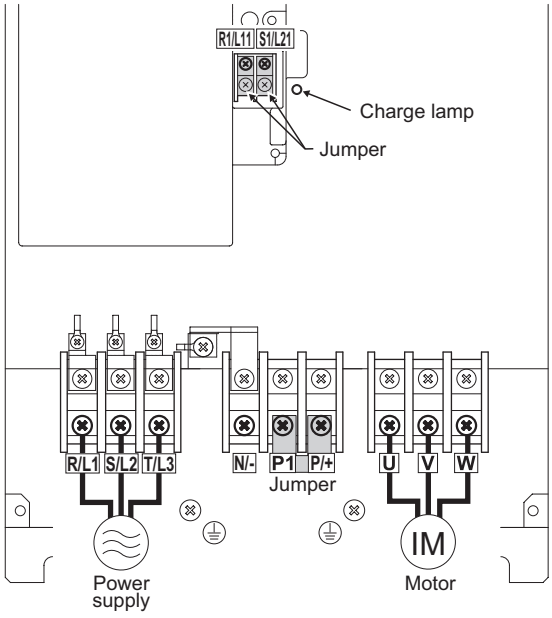
FR-A720-11K
FR-A740-11K, 15K



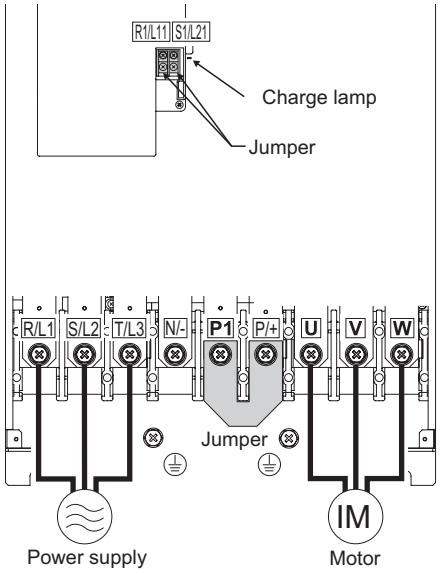
FR-A720-15K to 22K
FR-A740-18.5K, 22K



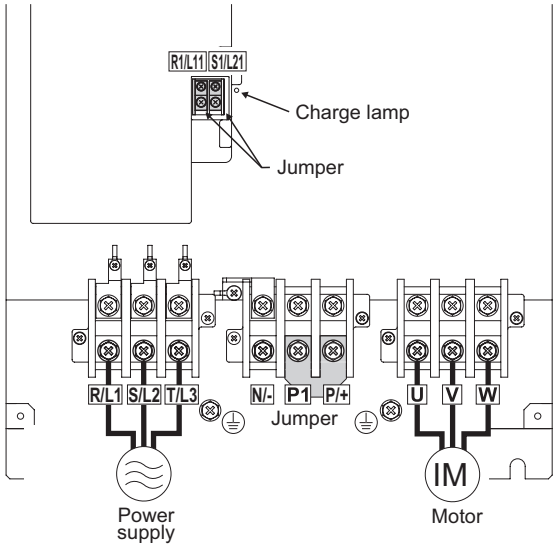
FR-A720-30K to 45K
FR-A740-30K to 45K



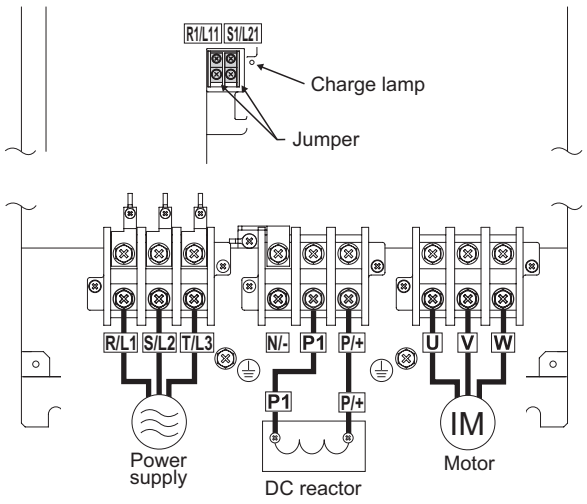
FR-A720-55K



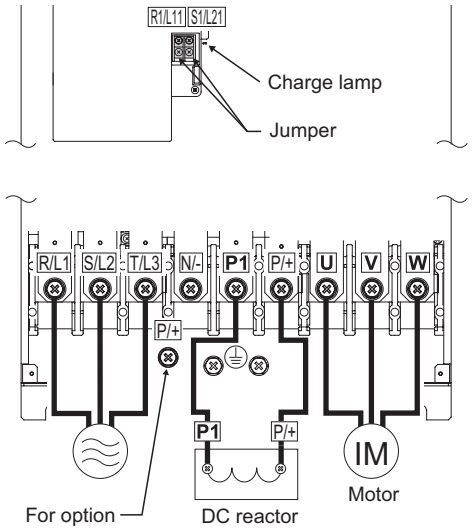
FR-A740-55K



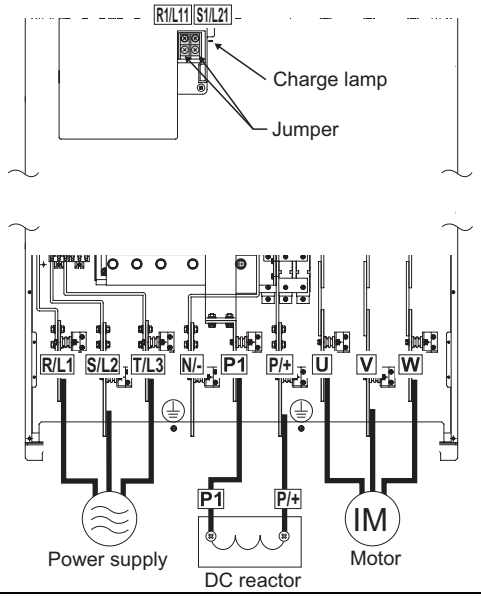
FR-A740-75K, 90K



FR-A720-75K, 90K
FR-A740-110K to 185K

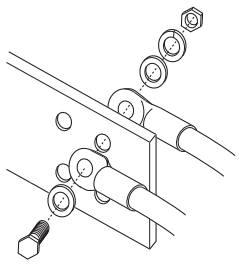


FR-A740-220K to 500K



CAUTION

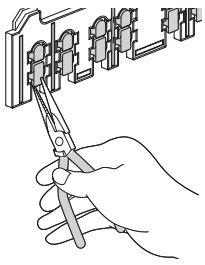
- The power supply cables must be connected to R/L1, S/L2, T/L3. (Phase sequence needs not to be matched.) Never connect the power cable to the U, V, W of the inverter. Doing so will damage the inverter.
- Connect the motor to U, V, W. At this time, turning ON the forward rotation switch (signal) rotates the motor in the counterclockwise direction when viewed from the motor shaft.
- When wiring the inverter main circuit conductor of the 220K or higher, tighten a nut from the right side of the conductor. When wiring two wires, place wires on both sides of the conductor. (Refer to the drawing on the right.) For wiring, use bolts (nuts) provided with the inverter.

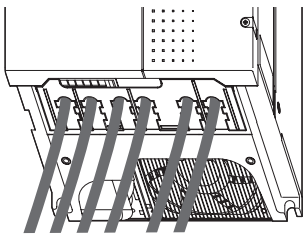


- Handling of the wiring cover
  (FR-A720-15K, 18.5K, 22K, FR-A740-18.5K, 22K)
  For the hook of the wiring cover, cut off the necessary parts using a pair of long-nose pliers etc.

CAUTION

Cut off the same number of lugs as wires. If parts where no wire is put through has been cut off (10mm or more), protective structure (JEM1030) becomes an open type (IP00).





(1) Cable sizes and other specifications of the main circuit terminals and the earthing terminal

Select the recommended cable size to ensure that a voltage drop will be 2% max.
If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency.
The following table indicates a selection example for the wiring length of 20m.

200V class (when input power supply is 220V)

Applicable Inverter Model	Terminal Screw Size *4	Tightening Torque N·m	Crimping Terminal		Cable Sizes								
					HIV, etc. (mm²) *1				AWG/MCM *2		PVC, etc. (mm²) *3		
			R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	P/+, P1	Earthing cable	R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	Earthing cable
FR-A720-0.4K to 2.2K	M4	1.5	2-4	2-4	2	2	2	2	14	14	2.5	2.5	2.5
FR-A720-3.7K	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	3.5	12	12	4	4	4
FR-A720-5.5K	M5(M4)	2.5	5.5-5	5.5-5	5.5	5.5	5.5	5.5	10	10	6	6	6
FR-A720-7.5K	M5(M4)	2.5	14-5	8-5	14	8	14	5.5	6	8	16	10	16
FR-A720-11K	M5	2.5	14-5	14-5	14	14	14	14	6	6	16	16	16
FR-A720-15K	M6	4.4	22-6	22-6	22	22	22	14	4	4	25	25	16
FR-A720-18.5K	M8(M6)	7.8	38-8	38-8	38	38	38	22	2	2	35	35	25
FR-A720-22K	M8(M6)	7.8	38-8	38-8	38	38	38	22	2	2	35	35	25
FR-A720-30K	M8(M6)	7.8	60-8	60-8	60	60	60	22	1/0	1/0	50	50	25
FR-A720-37K	M10(M8)	14.7	80-10	80-10	80	80	80	22	3/0	3/0	70	70	35
FR-A720-45K	M10(M8)	14.7	100-10	100-10	100	100	100	38	4/0	4/0	95	95	50
FR-A720-55K	M12(M8)	24.5	100-12	100-12	100	100	100	38	4/0	4/0	95	95	50
FR-A720-75K	M12(M10)	24.5	150-12	150-12	125	125	125	38	250	250	—	—	—
FR-A720-90K	M12(M10)	24.5	150-12	150-12	150	150	150	38	300	300	—	—	—

400V class (when input power supply is 440V)

Applicable Inverter Model	Terminal Screw Size *4	Tightening Torque N·m	Crimping Terminal		Cable Sizes								
					HIV, etc. (mm²) *1				AWG/MCM *2		PVC, etc. (mm²) *3		
			R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	P/+, P1	Earthing Cable	R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	Earthing Cable
FR-A740-0.4K to 3.7K	M4	1.5	2-4	2-4	2	2	2	2	14	14	2.5	2.5	2.5
FR-A740-5.5K	M4	1.5	2-4	2-4	2	2	3.5	3.5	12	14	2.5	2.5	4
FR-A740-7.5K	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	3.5	12	12	4	4	4
FR-A740-11K	M5	2.5	5.5-5	5.5-5	5.5	5.5	5.5	8	10	10	6	6	10
FR-A740-15K	M5	2.5	8-5	8-5	8	8	8	8	8	8	10	10	10
FR-A740-18.5K	M6	4.4	14-6	8-6	14	8	14	14	6	8	16	10	16
FR-A740-22K	M6	4.4	14-6	14-6	14	14	22	14	6	6	16	16	16
FR-A740-30K	M6	4.4	22-6	22-6	22	22	22	14	4	4	25	25	16
FR-A740-37K	M8	7.8	22-8	22-8	22	22	22	14	4	4	25	25	16
FR-A740-45K	M8	7.8	38-8	38-8	38	38	38	22	1	2	50	50	25
FR-A740-55K	M8	7.8	60-8	60-8	60	60	60	22	1/0	1/0	50	50	25
FR-A740-75K	M10	14.7	60-10	60-10	60	60	60	38	1/0	1/0	50	50	25
FR-A740-90K	M10	14.7	60-10	60-10	60	60	80	38	3/0	3/0	50	50	25
FR-A740-110K	M10(M12)	14.7	80-10	80-10	80	80	80	38	3/0	3/0	70	70	35
FR-A740-132K	M10(M12)	14.7	100-10	100-10	100	100	100	38	4/0	4/0	95	95	50
FR-A740-160K	M12(M10)	24.5	150-12	150-12	125	150	150	38	250	250	120	120	70
FR-A740-185K	M12(M10)	24.5	150-12	150-12	150	150	150	38	300	300	150	150	95
FR-A740-220K	M12(M10)	46	100-12	100-12	2×100	2×100	2×100	60	2×4/0	2×4/0	2×95	2×95	95
FR-A740-250K	M12(M10)	46	100-12	100-12	2×100	2×100	2×125	60	2×4/0	2×4/0	2×95	2×95	95
FR-A740-280K	M12(M10)	46	150-12	150-12	2×125	2×125	2×125	60	2×250	2×250	2×120	2×120	120
FR-A740-315K	M12(M10)	46	150-12	150-12	2×150	2×150	2×150	100	2×300	2×300	2×150	2×150	150
FR-A740-355K	M12(M10)	46	C2-200	C2-200	2×200	2×200	2×200	100	2×350	2×350	2×185	2×185	2×95
FR-A740-400K	M12(M10)	46	C2-200	C2-200	2×200	2×200	2×200	100	2×400	2×400	2×185	2×185	2×95
FR-A740-450K	M12(M10)	46	C2-250	C2-250	2×250	2×250	2×250	100	2×500	2×500	2×240	2×240	2×120
FR-A740-500K	M12(M10)	46	C2-200	C2-250	3×200	2×250	3×200	2×100	2×500	2×500	2×240	2×240	2×120

*1 For the 55K or lower, the cable size is that of the cable (HIV cable (600V class 2 vinyl-insulated cable) etc.) with continuous maximum permissible temperature of 75°C. Assumes that the surrounding air temperature is 50°C or less and the wiring distance is 20m or less.
For the 75K or higher, the recommended cable size is that of the cable (LMFC (heat resistant flexible cross-linked polyethylene insulated cable) etc.) with continuous maximum permissible temperature of 90°C. Assumes that the surrounding air temperature is 50°C or less and wiring is performed in an enclosure.

*2 For the all capacity of 200V class, and FR-A740-45K or lower, the recommended cable size is that of the cable (THHW cable) with continuous maximum permissible temperature of 75°C. Assumes that the surrounding air temperature is 40°C or less and the wiring distance is 20m or less.

For the FR-A740-55K or higher, the recommended cable size is that of the cable (THHN cable) with continuous maximum permissible temperature of 90°C. Assumes that the surrounding air temperature is 40°C or less and wiring is performed in an enclosure.
(Selection example for use mainly in the United States.)

*3 For the FR-A720-15K or lower, and FR-A740-45K or lower, the recommended cable size is that of the cable (PVC cable) with continuous maximum permissible temperature of 70°C. Assumes that the surrounding air temperature is 40°C or less and the wiring distance is 20m or less.
For the FR-A720-18.5K or higher, and FR-A740-55K or higher, the recommended cable size is that of the cable (XLPE cable) with continuous maximum permissible temperature of 90°C. Assumes that the surrounding air temperature is 40°C or less and wiring is performed in an enclosure.
(Selection example for use mainly in Europe.)

*4 The terminal screw size indicates the terminal size for R/L1, S/L2, T/L3, U, V, W, PR, PX, P/+, N/-, P1 and a screw for earthing (grounding).
For the 5.5K and 7.5K of 200V class, screw size of terminal PR and PX is indicated in ( ).
A screw for earthing (grounding) of the 18.5K of 200V class or higher is indicated in ( ).
A screw for P/+ terminal for option connection of the 110K and 132K of 400V class is indicated in ( ).
A screw for earthing (grounding) of the 160K of 400V class or higher is indicated in ( ).

The line voltage drop can be calculated by the following formula:

$$\text{Line voltage drop [V]} = \frac{\sqrt{3} \times \text{wire resistance[m}\Omega\text{/m]} \times \text{wiring distance[m]} \times \text{current[A]}}{1000}$$

Use a larger diameter cable when the wiring distance is long or when it is desired to decrease the voltage drop (torque reduction) in the low speed range.

CAUTION

- Tighten the terminal screw to the specified torque.
  A screw that has been tighten too loosely can cause a short circuit or malfunction.
  A screw that has been tighten too tightly can cause a short circuit or malfunction due to the unit breakage.
- Use crimping terminals with insulation sleeve to wire the power supply and motor.

(2) Notes on earthing (grounding)

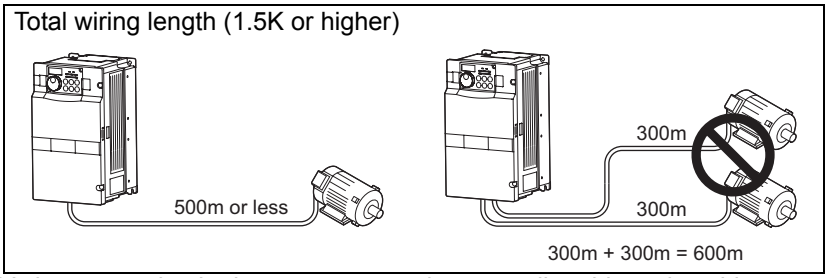
- Leakage currents flow in the inverter. To prevent an electric shock, the inverter and motor must be earthed (grounded). This inverter must be earthed (grounded). Earthing (Grounding) must conform to the requirements of national and local safety regulations and electrical codes. (NEC section 250, IEC 536 class 1 and other applicable standards)
  A neutral-point earthed (grounded) power supply for 400V class inverter in compliance with EN standard must be used.
- Use the dedicated earth (ground) terminal to earth (ground) the inverter.
  (Do not use the screw in the casing, chassis, etc.)
- Use the thickest possible earth (ground) cable. Use the cable whose size is equal to or greater than that indicated in *page 14, 14*, and minimize the cable length. The earthing (grounding) point should be as near as possible to the inverter.

To be compliant with the EU Directive (Low Voltage Directive), earth (ground) the inverter according to the instructions on page 196.

(3) Total wiring length

The overall wiring length for connection of a single motor or multiple motors should be within the value in the table below. (The wiring length should be 100m maximum for vector control.)

Pr. 72 setting (carrier frequency)	0.4K	0.75K	1.5K or higher
2 (2kHz) or lower	300m	500m	500m
3 (3kHz) or higher	200m	300m	500m



When driving a 400V class motor by the inverter, surge voltages attributable to the wiring constants may occur at the motor terminals, deteriorating the insulation of the motor.
Take the following measures (1) or (2) in this case.

(1) Use a "400V class inverter-driven insulation-enhanced motor" and set frequency in *Pr. 72 PWM frequency selection* according to wiring length

	Wiring Length		
	50m or less	**50m to 100m**	**exceeding 100m**
Carrier frequency	14.5kHz or less	9kHz or less	4kHz or less

(2) Connect the surge voltage suppression filter (FR-ASF-H/FR-BMF-H) to the 55K or lower and the sine wave filter (MT-BSL/BSC) to the 75K or higher on the inverter output side.

CAUTION

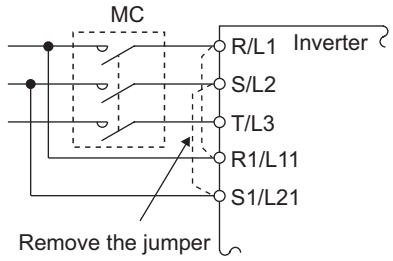
- Especially for long-distance wiring, the inverter may be affected by a charging current caused by the stray capacitances of the wiring, leading to a malfunction of the overcurrent protective function or fast response current limit function or a malfunction or fault of the equipment connected on the inverter output side. If fast response current limit function malfunctions, disable this function.
  (For *Pr. 156 Stall prevention operation selection, refer to Chapter 4 of the Instruction Manual (Applied).*)
- For details of *Pr. 72 PWM frequency selection , refer to Chapter 4 of the Instruction Manual (Applied)*. (When using an option sine wave filter (MT-BSL/BSC) for the 75K or higher, set "25" (2.5kHz) in *Pr. 72*.)
  For explanation of surge voltage suppression filter (FR-ASF-H/FR-BMF-H) and sine wave filter (MT-BSL/BSC), refer to the manual of each option.
- The surge voltage suppression filter (FR-ASF-H/FR-BMF-H) can be used under V/F control and under Advanced magnetic flux vector control. The sine wave filter (MT-BSL/BSC) can be used under V/F control.

(4) Cable size of the control circuit power supply (terminal R1/L11, S1/L21)

- Terminal screw size: M4
- Cable size: 0.75mm^2 to 2mm^2
- Tightening torque: 1.5N·m

(5) Connecting the control circuit and the main circuit separately to the power supply

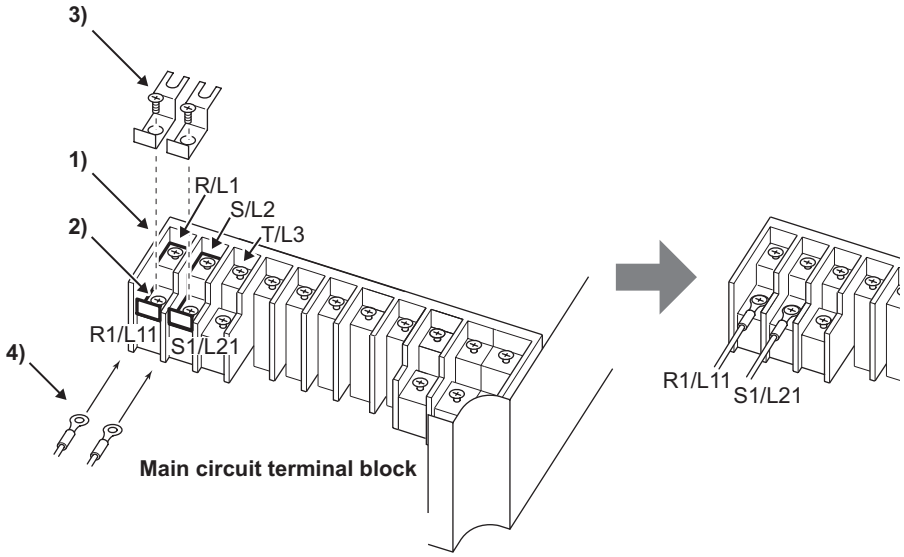
<Connection diagram>



When a fault occurs, opening of the electromagnetic contactor (MC) on the inverter power supply side results in power loss in the control circuit, disabling the fault output signal retention. Terminals R1/L11 and S1/L21 are provided to hold a fault signal. In this case, connect the power supply terminals R1/L11 and S1/L21 of the control circuit to the input side of the MC. Do not connect the power cable to incorrect terminals. Doing so may damage the inverter.

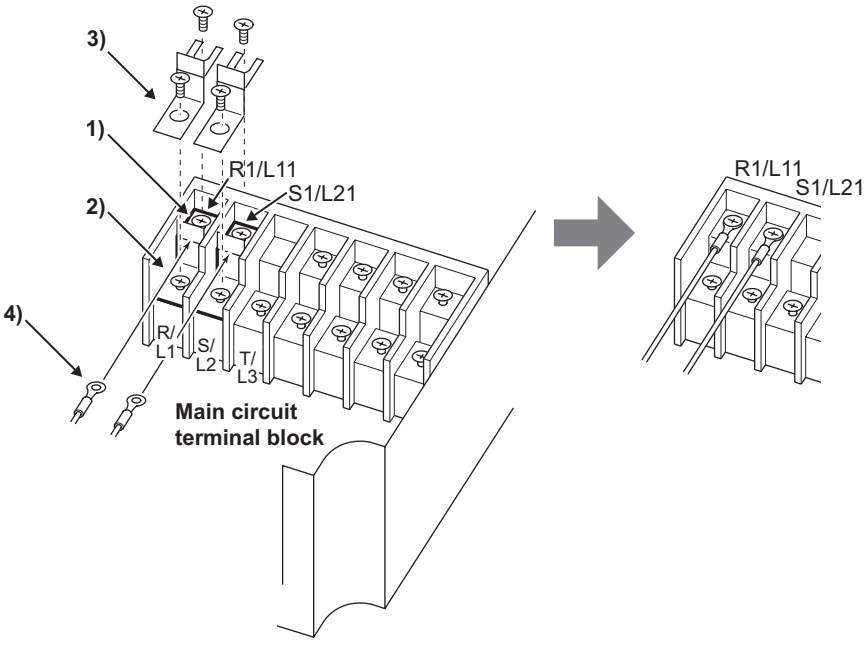
• FR-A720-0.4K to 3.7K, FR-A740-0.4K to 3.7K

1) Loosen the upper screws.
2) Remove the lower screws.
3) Remove the jumper
4) Connect the separate power supply cable for the control circuit to the lower terminals (R1/L11, S1/L21).



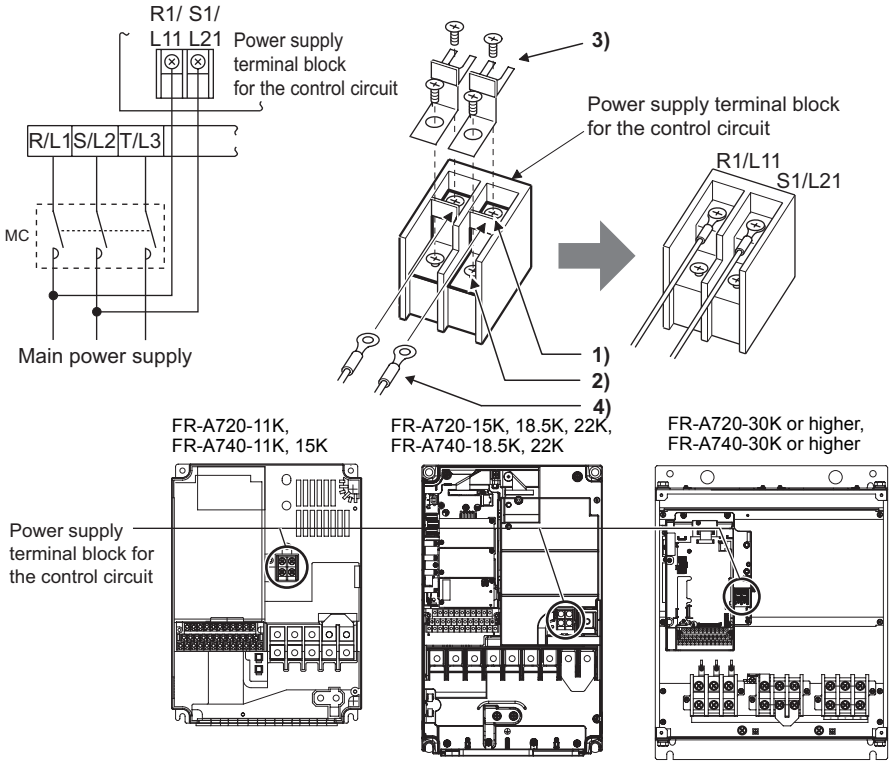
• FR-A720-5.5K, 7.5K, FR-A740-5.5K, 7.5K

1) Remove the upper screws.
2) Remove the lower screws.
3) Remove the jumper.
4) Connect the separate power supply cable for the control circuit to the upper terminals (R1/L11, S1/L21).



• FR-A720-11K or higher, FR-A740-11K or higher

1) Remove the upper screws.
2) Remove the lower screws.
3) Pull the jumper toward you to remove.
4) Connect the separate power supply cable for the control circuit to the upper terminals (R1/L11, S1/L21).



CAUTION

- When using separate power supply, always remove the jumper across terminals R/L1 and R1/L11 and across S/L2 and S1/L21. The inverter may be damaged if you do not remove the jumper.
- The voltage should be the same as that of the main control circuit when the control circuit power is supplied from other than the primary side of the MC.
- The power capacity necessary when separate power is supplied from R1/L11 and S1/L21 differs according to the inverter capacity.

	11K or lower	15K	18.5K or higher
200V class	60VA	80VA	80VA
400V class	60VA	60VA	80VA

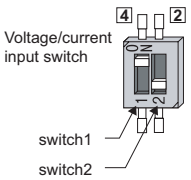
- If the main circuit power is switched OFF (for 0.1s or more) then ON again, the inverter resets and a fault output will not be held.

2.4.5 Control circuit terminals

[ ] indicates that terminal functions can be selected using *Pr. 178 to Pr. 196 (I/O terminal function selection) (Refer to Chapter 4 of the Instruction Manual (Applied).*)

(1) Input signals

Type	Terminal Symbol	Terminal Name	Description		Rated Specifications	Refer to page
Contact input	STF	Forward rotation start	Turn ON the STF signal to start forward rotation and turn it OFF to stop.	When the STF and STR signals are turned ON simultaneously, the stop command is given.	Input resistance 4.7kΩ Voltage at opening: 21 to 27VDC Contacts at short-circuited: 4 to 6mADC	87
	STR	Reverse rotation start	Turn ON the STR signal to start reverse rotation and turn it OFF to stop.			
	STOP	Start self-holding selection	Turn ON the STOP signal to self-hold the start signal.			*2
	RH, RM, RL	Multi-speed selection	Multi-speed can be selected according to the combination of RH, RM and RL signals.			88
	JOG	Jog mode selection	Turn ON the JOG signal to select Jog operation (initial setting) and turn ON the start signal (STF or STR) to start Jog operation.			*2
		Pulse train input	JOG terminal can be used as pulse train input terminal. To use as pulse train input terminal, the *Pr. 291* setting needs to be changed. (maximum input pulse: 100kpulses/s)		Input resistance 2kΩ Contacts at short-circuited: 8 to 13mADC	*2
	RT	Second function selection	Turn ON the RT signal to select second function. When the second function such as "second torque boost" and "second V/F (base frequency)" are set, turning ON the RT signal selects these functions.		Input resistance 4.7kΩ Voltage at opening: 21 to 27VDC Contacts at short-circuited: 4 to 6mADC	*2
	MRS	Output stop	Turn ON the MRS signal (20ms or more) to stop the inverter output. Use to shut off the inverter output when stopping the motor by electromagnetic brake.			*2
	RES	Reset	Used to reset fault output provided when fault occurs. Turn ON the RES signal for more than 0.1s, then turn it OFF. Initial setting is for reset always. By setting *Pr. 75*, reset can be set to enabled only at fault occurrence. Recover about 1s after reset is cancelled.			137
	AU	Terminal 4 input selection	Terminal 4 is valid only when the AU signal is turned ON. (The frequency setting signal can be set between 4 and 20mADC.) Turning the AU signal ON makes terminal 2 (voltage input) invalid.			91
		PTC input	AU terminal is used as PTC input terminal (thermal protection of the motor). When using it as PTC input terminal, set the AU/PTC switch to PTC.			*2
	CS	Selection of automatic restart after instantaneous power failure	When the CS signal is left ON, the inverter restarts automatically at power restoration. Note that restart setting is necessary for this operation. In the initial setting, a restart is disabled. *(Refer to Pr. 57 Restart coasting time in Chapter 4 of the Instruction Manual (Applied).)*			*2
	SD	Contact input common (sink) (initial setting)	Common terminal for contact input terminal (sink logic) and terminal FM.		———	—
		External transistor common (source)	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the source logic to avoid malfunction by undesirable currents.			
		24VDC power supply common	Common output terminal for 24VDC 0.1A power supply (PC terminal). Isolated from terminals 5 and SE.			

Type	Terminal Symbol	Terminal Name	Description	Rated Specifications	Refer to page
Contact input	PC	External transistor common (sink) (initial setting)	Connect this terminal to the power supply common terminal of a transistor output (open collector output) device, such as a programmable controller, in the sink logic to avoid malfunction by undesirable currents.	Power supply voltage range 19.2 to 28.8VDC Permissible load current 100mA	23
		Contact input common (source)	Common terminal for contact input terminal (source logic).		
		24VDC power supply	Can be used as 24VDC 0.1A power supply.		
Frequency setting	10E	Frequency setting power supply	When connecting the frequency setting potentiometer at an initial status, connect it to terminal 10. Change the input specifications of terminal 2 when connecting it to terminal 10E. *(Refer to Pr. 73 Analog input selection in Chapter 4 of the Instruction Manual (Applied).)*	10VDC Permissible load current 10mA	*2
	10			5VDC Permissible load current 10mA	85, 89
	2	Frequency setting (voltage)	Inputting 0 to 5VDC (or 0 to 10V, 0 to 20mA) provides the maximum output frequency at 5V (10V, 20mA) and makes input and output proportional. Use *Pr. 73* to switch from among input 0 to 5VDC (initial setting), 0 to 10VDC, and 0 to 20mA. Set the voltage/current input switch in the ON position to select current input (0 to 20mA). *1	Voltage input: Input resistance 10kΩ ± 1kΩ Maximum permissible voltage 20VDC Current input: Input resistance 245Ω ± 5Ω Maximum permissible current 30mA	85, 89
	4	Frequency setting (current)	Inputting 4 to 20mADC (or 0 to 5V, 0 to 10V) provides the maximum output frequency at 20mA makes input and output proportional. This input signal is valid only when the AU signal is ON (terminal 2 input is invalid). Use *Pr. 267* to switch from among input 4 to 20mA (initial setting), 0 to 5VDC, and 0 to 10VDC. Set the voltage/current input switch in the OFF position to select voltage input (0 to 5V/0 to 10V). *1 Use *Pr. 858* to switch terminal functions. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*		86, 91
	1	Frequency setting auxiliary	Inputting 0 to ±5 VDC or 0 to ±10VDC adds this signal to terminal 2 or 4 frequency setting signal. Use *Pr. 73* to switch between the input 0 to ±5VDC and 0 to ±10VDC (initial setting). Use *Pr. 868* to switch terminal functions.	Input resistance 10kΩ ± 1kΩ Maximum permissible voltage ± 20VDC	*2
	5	Frequency setting common	Common terminal for frequency setting signal (terminal 2, 1 or 4) and analog output terminal AM. Do not earth (ground).	———	—

*1 Set *Pr. 73*, *Pr. 267*, and a voltage/current input switch correctly, then input an analog signal in accordance with the setting.
Applying a voltage signal with voltage/current input switch ON (current input is selected) or a current signal with switch OFF (voltage input is selected) could cause component damage of the inverter or analog circuit of signal output devices.

*2 *Refer to Chapter 4 of the Instruction Manual (Applied).*

(2) Output signals

Type	Terminal Symbol	Terminal Name	Description	Rated Specifications	Refer to page
Relay	A1, B1, C1	Relay output 1 (Fault output)	1 changeover contact output indicates that the inverter protective function has activated and the output stopped. Fault: No conduction across B-C (Across A-C Continuity), Normal: Across B-C Continuity (No conduction across A-C)	Contact capacity: 230VAC 0.3A (Power factor = 0.4) 30VDC 0.3A	*
	A2, B2, C2	Relay output 2	1 changeover contact output		*

Type	Terminal Symbol	Terminal Name	Description		Rated Specifications	Refer to page
Open collector	RUN	Inverter running	Switched low when the inverter output frequency is equal to or higher than the starting frequency (initial value 0.5Hz). Switched high during stop or DC injection brake operation.*		Permissible load 24VDC (27VDC maximum) 0.1A (A voltage drop is 2.8V maximum when the signal is ON.) Low is when the open collector output transistor is ON (conducts). High is when the transistor is OFF (does not conduct)	*
	SU	Up to frequency	Switched low when the output frequency reaches within the range of ±10% (initial value) of the set frequency. Switched high during acceleration/ deceleration and at a stop.	Fault code (4bit) output		*
	OL	Overload warning	Switched low when stall prevention is activated by the stall prevention function. Switched high when stall prevention is cancelled.			*
	IPF	Instantaneous power failure	Switched low when an instantaneous power failure and under voltage protections are activated.			*
	FU	Frequency detection	Switched low when the inverter output frequency is equal to or higher than the preset detected frequency and high when less than the preset detected frequency.			*
	SE	Open collector output common	Common terminal for terminals RUN, SU, OL, IPF, FU		———	—
Pulse	FM	For meter	Select one e.g. output frequency from monitor items. Not output during inverter reset. The output signal is proportional to the magnitude of the corresponding monitoring item. Use *Pr. 55*, *Pr. 56*, and *Pr. 866* to set full scales for the monitored output frequency, output current, and torque. *(Refer to page 263)*	Output item: Output frequency (initial setting)	Permissible load current 2mA 1440pulses/s at 60Hz	*
		NPN open collector output		signals can be output from the open collector terminals by setting *Pr. 291*.	Maximum output pulse: 50kpulses/s Permissible load current : 80mA	*
Analog	AM	Analog signal output		Output item: Output frequency (initial setting)	Output signal 0 to 10VDC Permissible load current 1mA (load impedance 10kΩ or more) Resolution 8 bit	*

* *Refer to Chapter 4 of the Instruction Manual (Applied).*

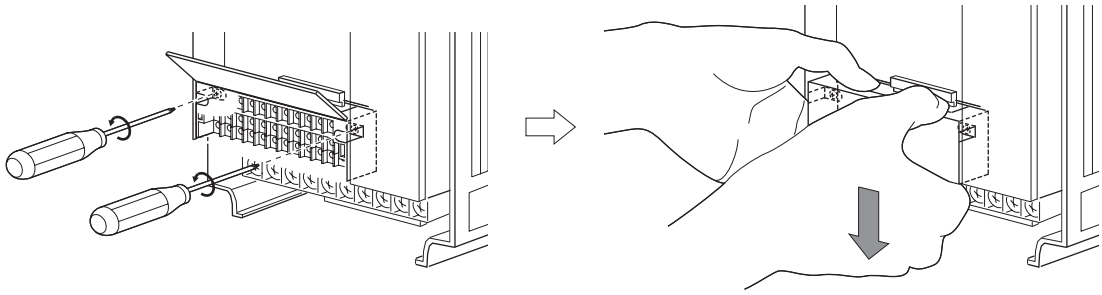
(3) Communication

Type	Terminal Symbol		Terminal Name	Description	Refer to page
RS-485	———		PU connector	With the PU connector, communication can be made through RS-485. (for connection on a 1:1 basis only) . Conforming standard : EIA-485 (RS-485) . Transmission format : Multidrop . Communication speed : 4800 to 38400bps . Overall length : 500m	25
	RS-485 terminals	TXD+	Inverter transmission terminal	With the RS-485 terminals, communication can be made through RS-485. Conforming standard : EIA-485 (RS-485) Transmission format : Multidrop link Communication speed : 300 to 38400bps Overall length : 500m	26
		TXD-			
		RXD+	Inverter reception terminal		
		RXD-			
		SG	Earth (Ground)		
USB	———		USB connector	FR Configurator can be used by connecting the inverter to the personal computer through USB. Interface: Conforms to USB1.1 Transmission speed: 12Mbps Connector: USB B connector (B receptacle)	27

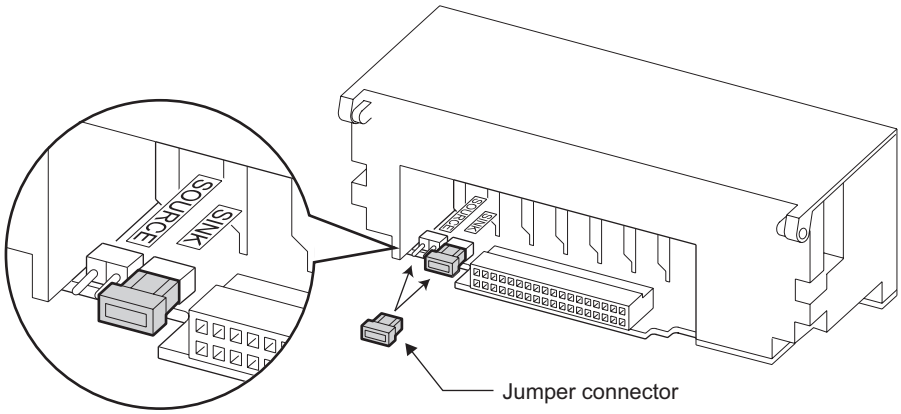
2.4.6 Changing the control logic

The input signals are set to sink logic (SINK) when shipped from the factory.
To change the control logic, the jumper connector on the back of the control circuit terminal block must be moved to the other position.
(The output signals may be used in either the sink or source logic independently of the jumper connector position.)

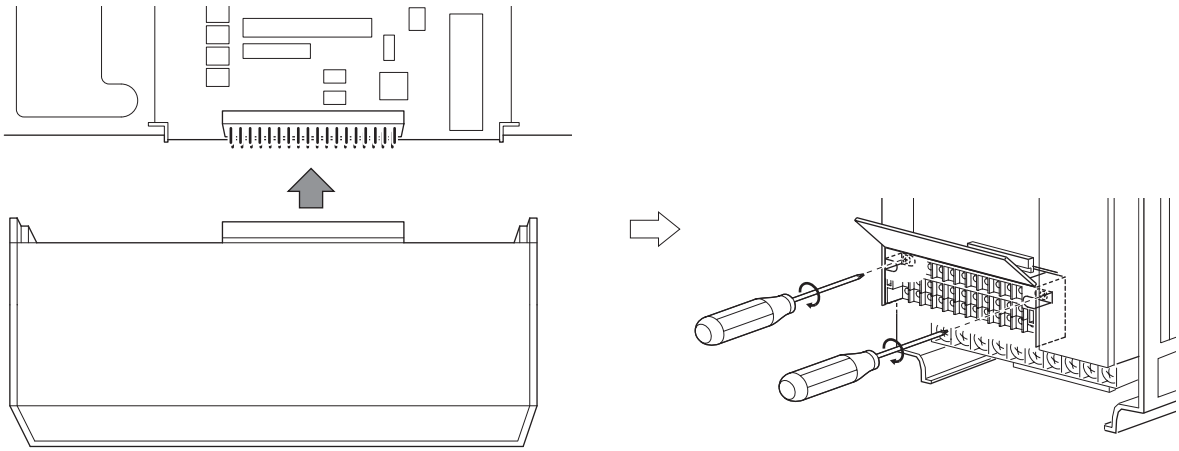
1) Loosen the two installation screws in both ends of the control circuit terminal block. (These screws cannot be removed.)
   Pull down the terminal block from behind the control circuit terminals.



2) Change the jumper connector set to the sink logic (SINK) on the rear panel of the control circuit terminal block to source logic (SOURCE).



3) Using care not to bend the pins of the inverter's control circuit connector, reinstall the control circuit terminal block and fix it with the mounting screws.



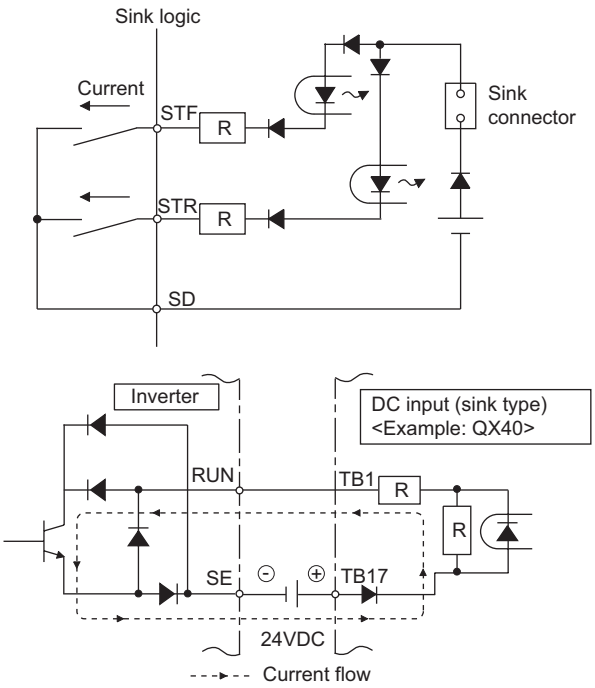
CAUTION

1. Make sure that the control circuit connector is fitted correctly.
2. While power is ON, never disconnect the control circuit terminal block.

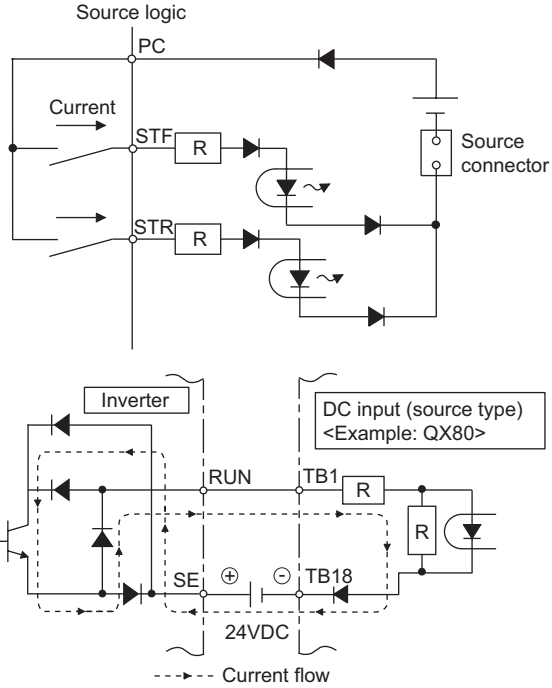
4) Sink logic and source logic

- In sink logic, a signal switches ON when a current flows from the corresponding signal input terminal. Terminal SD is common to the contact input signals. Terminal SE is common to the open collector output signals.
- In source logic, a signal switches ON when a current flows into the corresponding signal input terminal. Terminal PC is common to the contact input signals. Terminal SE is common to the open collector output signals.

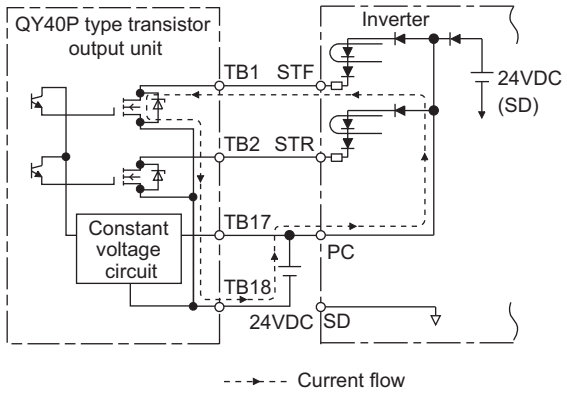
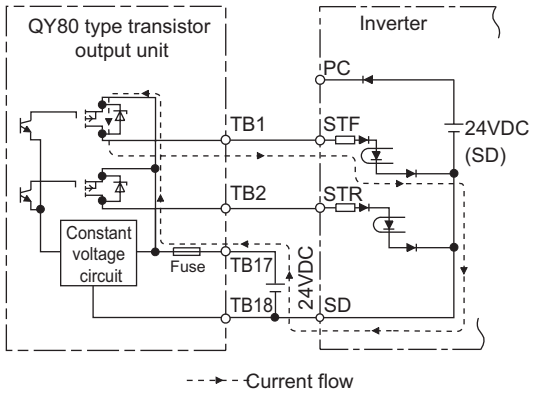
●Current flow concerning the input/output signal when sink logic is selected



●Current flow concerning the input/output signal when source logic is selected

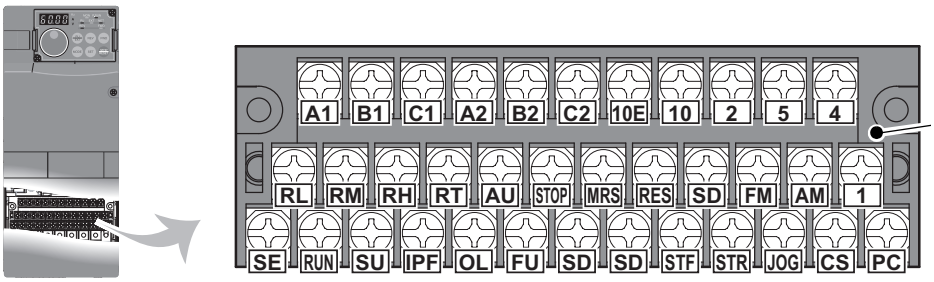


- When using an external power supply for transistor output

• Sink logic type Use terminal PC as a common terminal, and perform wiring as shown below. (Do not connect terminal SD of the inverter with terminal 0V of the external power supply. When using terminals PC-SD as a 24VDC power supply, do not install an external power supply in parallel with the inverter. Doing so may cause a malfunction in the inverter due to undesirable currents.)	• Source logic type Use terminal SD as a common terminal, and perform wiring as shown below. (Do not connect terminal PC of the inverter with terminal +24V of the external power supply. When using terminals PC-SD as a 24VDC power supply, do not install an external power supply in parallel with the inverter. Doing so may cause a malfunction in the inverter due to undesirable currents.)
	

2.4.7 Wiring of control circuit

(1) Control circuit terminal layout



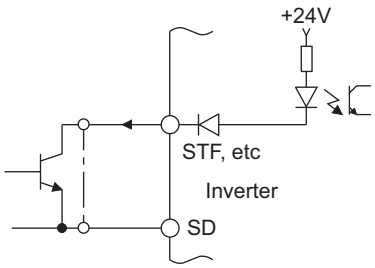
Control circuit terminal *
Terminal screw size: M3.5
Tightening torque: 1.2N·m
* Refer to instruction manuals of options for the available control terminals other than the standard control circuit terminal.

(2) Common terminals of the control circuit (SD, 5, SE)

Terminals SD, 5, and SE are all common terminals (0V) for I/O signals and are isolated from each other. Do not earth (ground) these terminals.
Avoid connecting the terminal SD and 5 and the terminal SE and 5.
Terminal SD is a common terminal for the contact input terminals (STF, STR, STOP, RH, RM, RL, JOG, RT, MRS, RES, AU, CS) and frequency output signal (FM).
The open collector circuit is isolated from the internal control circuit by photocoupler.
Terminal 5 is a common terminal for frequency setting signal (terminal 2, 1 or 4) and analog output terminal AM.
It should be protected from external noise using a shielded or twisted cable.
Terminal SE is a common terminal for the open collector output terminal (RUN, SU, OL, IPF, FU).
The contact input circuit is isolated from the internal control circuit by photocoupler.

(3) Signal inputs by contactless switches

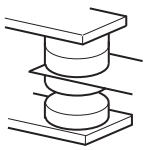
The contacted input terminals of the inverter (STF, STR, STOP, RH, RM, RL, JOG, RT, MRS, RES, AU, CS) can be controlled using a transistor instead of a contacted switch as shown on the right.



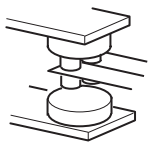
External signal input using transistor

2.4.8 Wiring instructions

1) It is recommended to use the cables of 0.75mm^2 gauge for connection to the control circuit terminals.
   If the cable gauge used is 1.25mm^2 or more, the front cover may be lifted when there are many cables running or the cables are run improperly, resulting in an operation panel contact fault.
2) The wiring length should be 30m (200m for terminal FM) maximum.



Micro signal contacts

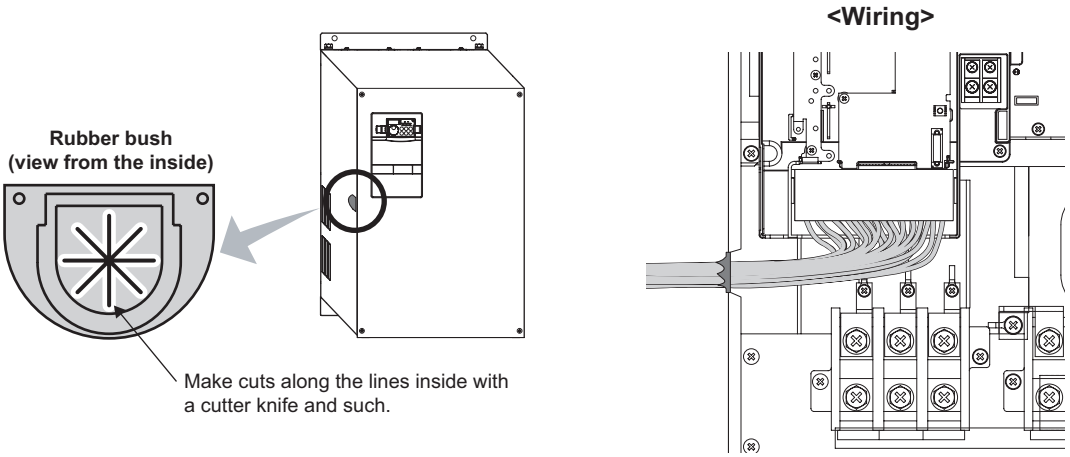


Twin contacts

3) Use two or more parallel micro-signal contacts or twin contacts to prevent a contact faults when using contact inputs since the control circuit input signals are micro-currents.
4) Use shielded or twisted cables for connection to the control circuit terminals and run them away from the main and power circuits (including the 200V relay sequence circuit).
5) Do not apply a voltage to the contact input terminals (e.g. STF) of the control circuit.
6) Always apply a voltage to the fault output terminals (A, B, C) via a relay coil, lamp, etc.

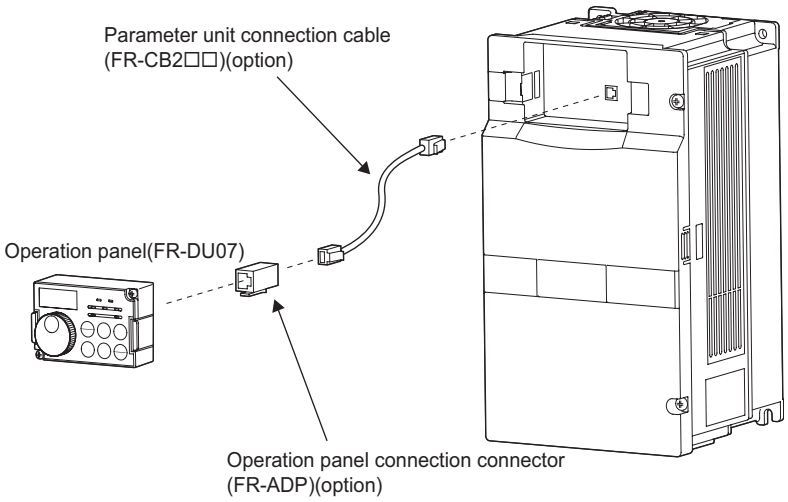
● Wiring of the control circuit of the 75K or higher

For wiring of the control circuit of the 75K or higher, separate away from wiring of the main circuit.
Make cuts in rubber bush of the inverter side and lead wires.



2.4.9 Mounting the operation panel (FR-DU07) on the enclosure surface

Having an operation panel or a parameter unit on the enclosure surface is convenient. With a connection cable, you can mount the operation panel (FR-DU07) to the enclosure surface, and connect it to the inverter.
Use the option FR-CB2☐☐, or the following connector and cable available on the market.
Securely insert one end of connection cable into the PU connector of the inverter and the other end into the connection connector of the operation panel (FR-DU07) along the guides until the stoppers are fixed.



CAUTION

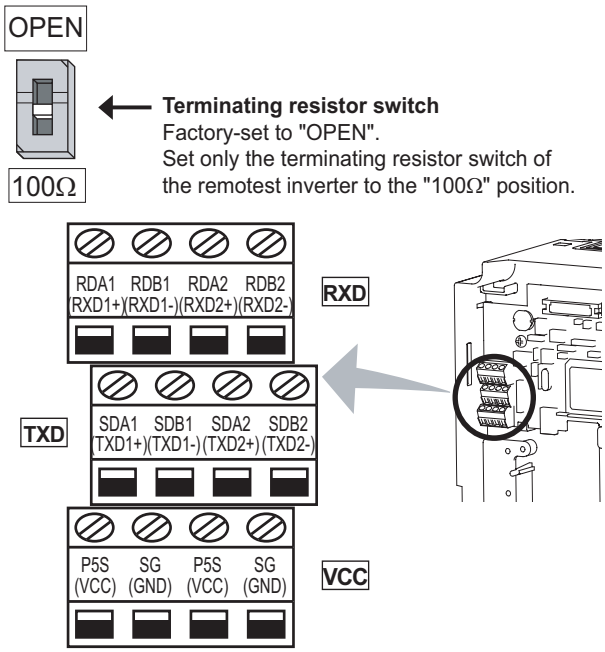
Do not connect the PU connector to the computer's LAN port, FAX modem socket or telephone connector.
The inverter and machine could be damaged due to differences in electrical specifications.

REMARKS

- *Refer to page 6* for removal method of the operation panel.
- When using a commercially available connector and cable as a parameter unit connection cable, refer to *Chapter 2 of the Instruction Manual (Applied)*.
- The inverter can be connected to the computer and FR-PU04/FR-PU07.

2.4.10 RS-485 terminal block

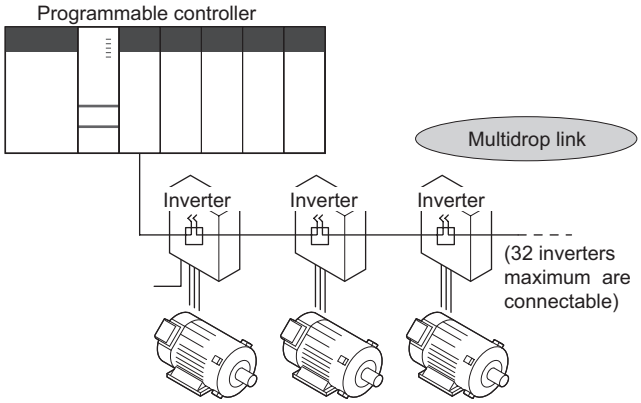
- Conforming standard: EIA-485(RS-485)
- Transmission format: Multidrop link
- Communication speed: MAX 38400bps
- Overall length: 500m
- Connection cable:Twisted pair cable (4 pairs)



2.4.11 Communication operation

Using the PU connector or RS-485 terminal, you can perform communication operation from a personal computer etc. When the PU connector is connected with a personal, FA or other computer by a communication cable, a user program can run and monitor the inverter or read and write to parameters.
For the Mitsubishi inverter protocol (computer link operation), communication can be performed with the PU connector and RS-485 terminal.
For the Modbus-RTU protocol, communication can be performed with the RS-485 terminal.

For further details, refer to *Chapter 4 of* 📖 *the Instruction Manual (Applied)*.

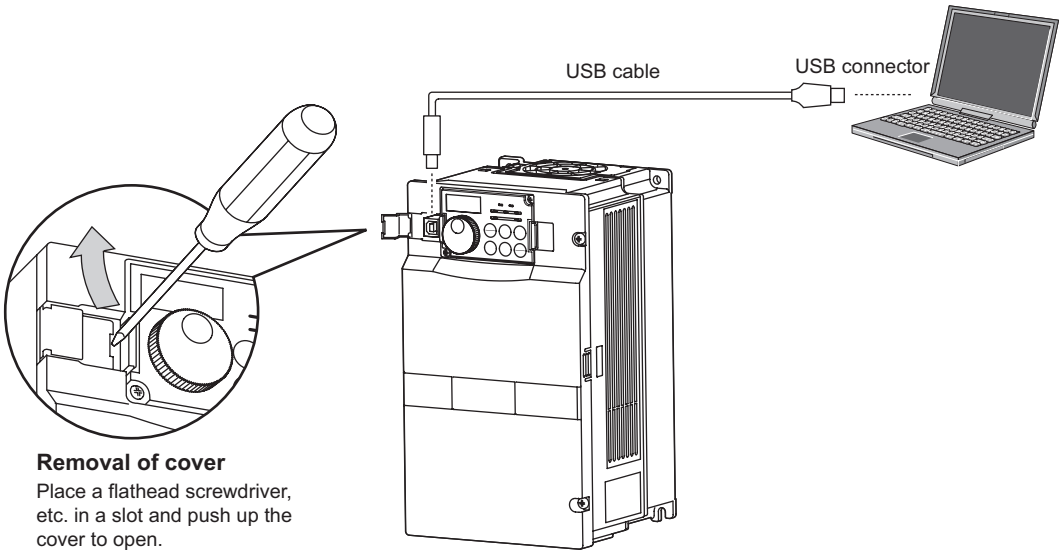


2.4.12 USB connector

A personal computer and an inverter can be connected with a USB (Ver1. 1) cable.
You can perform parameter setting and monitoring with the FR Configurator.

•USB communication specifications

Interface	Conforms to USB1.1
Transmission speed	12Mbps
Wiring length	Maximum 5m
Connector	USB B connector (B receptacle)
Power supply	Self-power supply

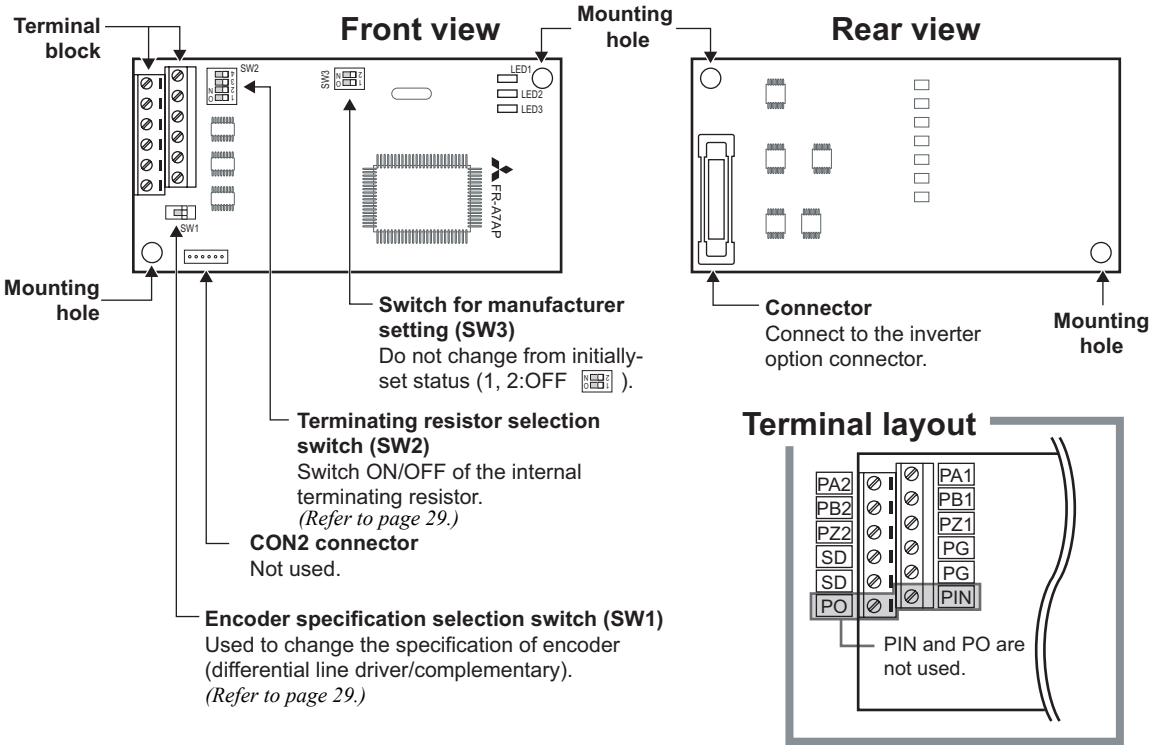


Removal of cover
Place a flathead screwdriver, etc. in a slot and push up the cover to open.

2.4.13 Connection of motor with encoder (vector control)

Orientation control and encoder feedback control, and speed control, torque control and position control by full-scale vector control operation can be performed using a motor with encoder and a plug-in option FR-A7AP.

(1) Structure of the FR-A7AP



(2) Terminals of the FR-A7AP

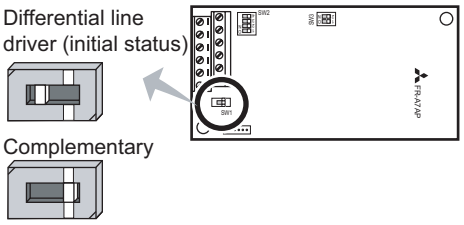
Terminal	Terminal Name	Description
PA1	Encoder A-phase signal input terminal	A-, B- and Z-phase signals are input from the encoder.
PA2	Encoder A-phase inverse signal input terminal	
PB1	Encoder B-phase signal input terminal	
PB2	Encoder B-phase inverse signal input terminal	
PZ1	Encoder Z-phase signal input terminal	
PZ2	Encoder Z-phase inversion signal input terminal	
PG	Encoder power supply (positive side) input terminal	Input terminal for the encoder power supply. Connect the external power supply (5V, 12V, 15V, 24V) and the encoder power cable. Make sure the voltage of the external power supply the same as the encoder output voltage. (Check the encoder specification.)
SD	Encoder power supply ground terminal	
PIN	Not used.	
PO		

CAUTION

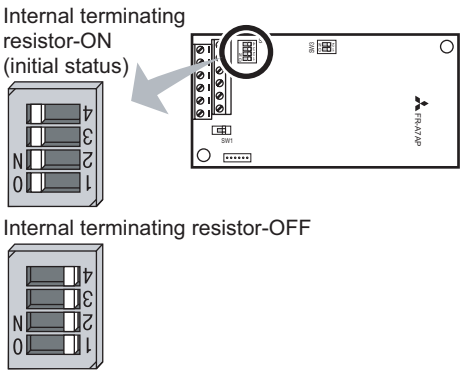
When the input power supply voltage to the encoder and its output voltage differ, the signal loss detection (E.ECT) may occur.

(3) Switches of the FR-A7AP

- Encoder specification selection switch (SW1)
  Select either differential line driver or complementary
  It is initially set to the differential line driver. Switch its position according to output circuit.



- Terminating resistor selection switch (SW2)
  Select ON/OFF of the internal terminating resistor. Set the switch to ON (initial status) when an encoder output type is differential line driver and set to OFF when complementary.
  ON : with internal terminating resistor (initial status)
  OFF : without internal terminating resistor



REMARKS

- Set all switches to the same setting (ON/OFF).
- If the encoder output type is differential line driver, set the terminating resistor switch to the "OFF" position when sharing the same encoder with other unit (NC (numerical controller), etc) or a terminating resistor is connected to other unit.

- Motor used and switch setting

Motor		Encoder Specification Selection Switch (SW1)	Terminating Resistor Selection Switch (SW2)	Power Specifications *2
Mitsubishi standard motor with encoder Mitsubishi high efficiency motor with encoder	SF-JR	Differential	ON	5V
	SF-HR	Differential	ON	5V
	Others	*1	*1	*1
Mitsubishi constant-torque motor with encoder	SF-JRCA	Differential	ON	5V
	SF-HRCA	Differential	ON	5V
	Others	*1	*1	*1
Vector control dedicated motor	SF-V5RU	Complementary	OFF	12V
Other manufacturer motor with encoder	–	*1	*1	*1

*1 Set according to the motor (encoder) used.
*2 Choose a power supply (5V/12V/15V/24V) for encoder according to the encoder output voltage.

CAUTION

SW3 switch is for manufacturer setting. Do not change the setting.

- Encoder specification

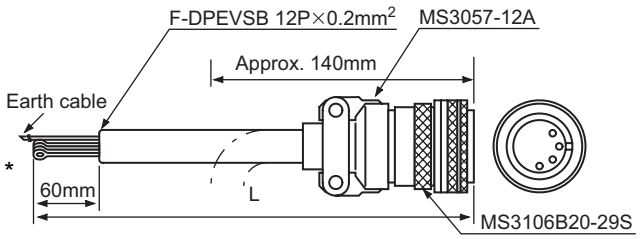
Item	Encoder for SF-JR/HR/JRCA/HRCA	Encoder for SF-V5RU
Resolution	1024 Pulse/Rev	2048 Pulse/Rev
Power supply voltage	5VDC±10%	12VDC±10%
Current consumption	150mA	150mA
Output signal form	A, B phases (90° phase shift) Z phase: 1 pulse/rev	A, B phases (90° phase shift) Z phase: 1 pulse/rev
Output circuit	Differential line driver 74LS113 equivalent	Complementary
Output voltage	H level: 2.4V or more L level: 0.5V or less	H level: "Power supply for encoder-3V" or more L level: 3V or less

CAUTION

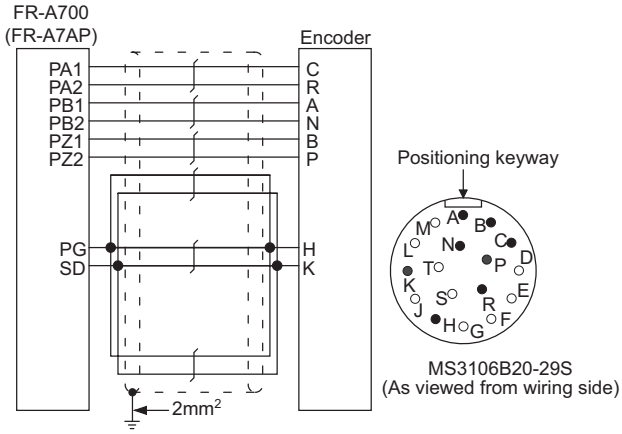
Encoder with resolution of 1000 to 4096 pulse/rev is recommended.

(4) Encoder Cable

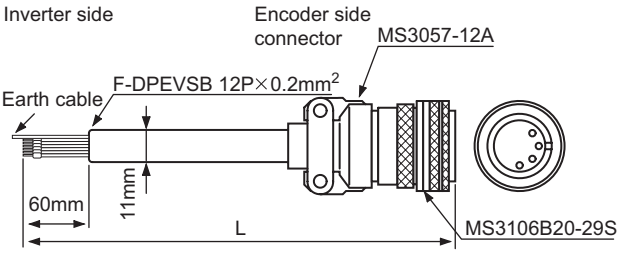
SF-JR Motor with Encoder



Type	Length L (m)
FR-JCBL5	5
FR-JCBL15	15
FR-JCBL30	30

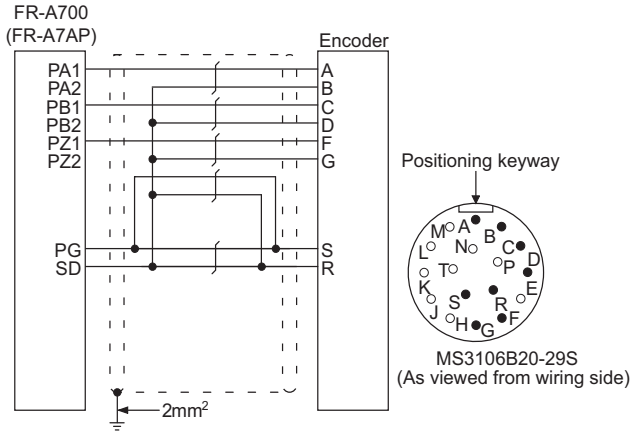


SF-V5RU, SF-THY



· A P clip for earthing (grounding) a shielded cable is provided.

Type	Length L (m)
FR-V7CBL5	5
FR-V7CBL15	15
FR-V7CBL30	30



* As the terminal block of the FR-A7AP is an insertion type, earth cables need to be modified. (See below)

- When using the dedicated encoder cable (FR-JCBL, FR-V5CBL, etc.) for the conventional motor, cut the crimpling terminal of the encoder cable and strip its sheath to make its cables loose.
  Also, protect the shielded cable of the twisted pair shielded cable to ensure that it will not make contact with the conductive area.
  Wire the stripped cable after twisting it to prevent it from becoming loose. In addition, do not solder it.

REMARKS

Information on blade terminals

Commercially available products (as of January 2010)

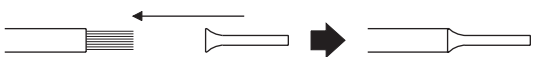
●Phoenix Contact Co.,Ltd.

Terminal Screw Size	Wire Size (mm²)	Blade Terminal Model		Blade terminal crimping tool
		with insulation sleeve	without insulation sleeve	
M2	0.3, 0.5	AI 0,5-6WH	A 0,5-6	CRIMPFOX 6

●NICHIFU Co.,Ltd.

Terminal Screw Size	Wire Size (mm²)	Blade terminal product number	Insulation product number	Blade terminal crimping tool
M2	0.3 to 0.75	BT 0.75-7	VC 0.75	NH 67

When using the blade terminal (without insulation sleeve), use care so that the twisted wires do not come out.

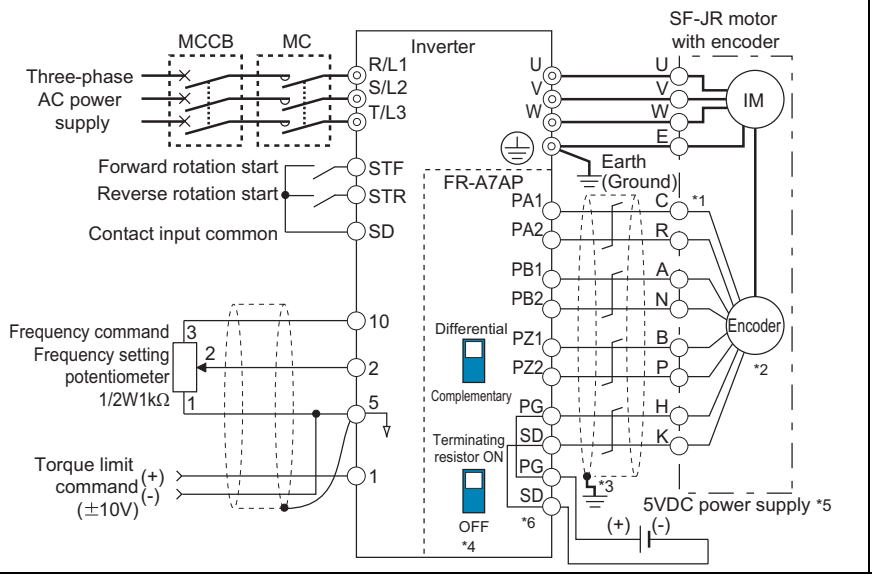
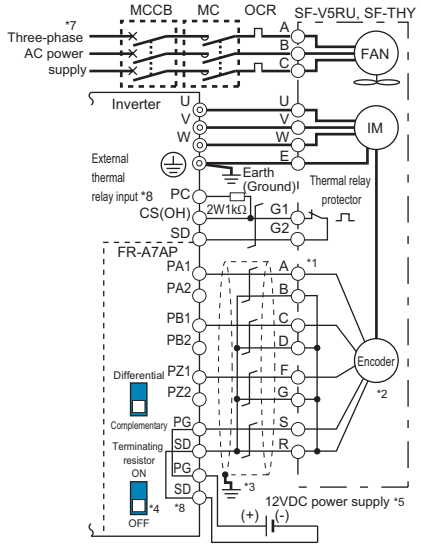


Connection terminal compatibility table

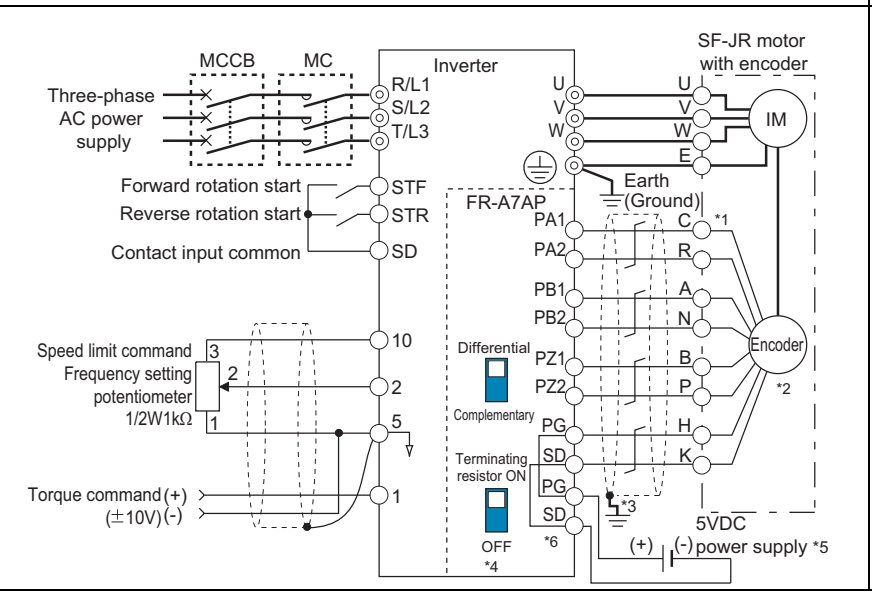
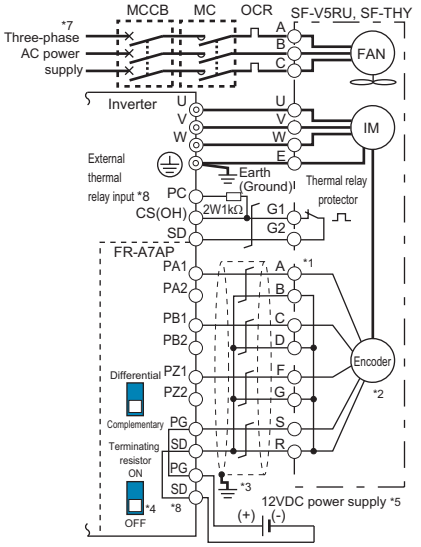
Motor		SF-V5RU, SF-THY	SF-JR/HR/JRCA/HRCA (with Encoder)
Encoder cable		FR-V7CBL	FR-JCBL
FR-A7AP terminal	PA1	PA	PA
	PA2	Keep this open.	PAR
	PB1	PB	PB
	PB2	Keep this open.	PBR
	PZ1	PZ	PZ
	PZ2	Keep this open.	PZR
	PG	PG	5E
	SD	SD	AG2

(5) Wiring

• Speed control

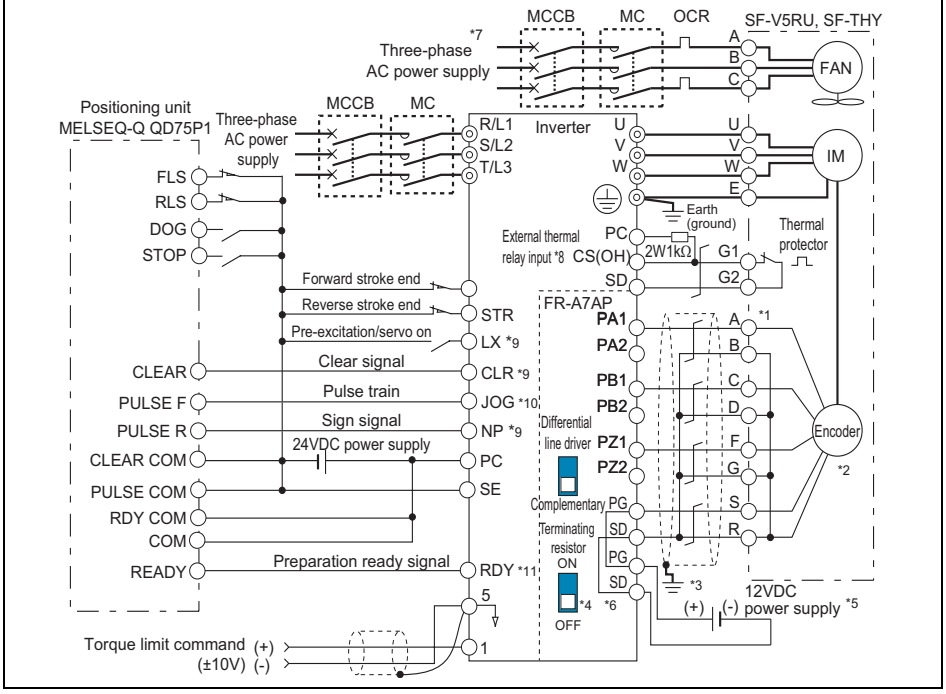
Standard motor with encoder (SF-JR), 5V differential line driver	Vector control dedicated motor (SF-V5RU, SF-THY), 12V complementary
	

• Torque control

Standard motor with encoder (SF-JR), 5V differential line driver	Vector control dedicated motor (SF-V5RU, SF-THY), 12V complementary
	

- Position control

Vector control dedicated motor (SF-V5RU, SF-THY), 12V complementary



*1 The pin number differs according to the encoder used.
Speed control, torque control and position control by pulse train input could be normally performed with or without connecting Z phase.

*2 Connect the encoder so that there is no looseness between the motor and motor shaft. Speed ratio should be 1:1.

*3 Earth (Ground) the shielded cable of the encoder cable to the enclosure with a P-clip, etc. *(Refer to page 33.)*

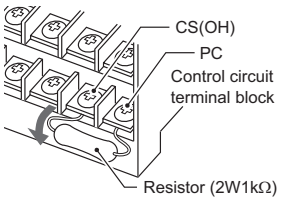
*4 For the complementary, set the terminating resistor selection switch to OFF position. *(Refer to page 29.)*

*5 A separate power supply of 5V/12V/15V/24V is necessary according to the encoder power specification.
Make the voltage of the external power supply the same as the encoder output voltage, and connect the external power supply between PG and SD.

*6 For terminal compatibility of the FR-JCBL, FR-V7CBL and FR-A7AP, refer to *page 31*.

*7 For the fan of the 7.5kW or less dedicated motor, the power supply is single phase. (200V/50Hz, 200 to 230V/60Hz)

*8 Assign OH (external thermal input) signal to the terminal CS. (Set "7" in *Pr. 186*)
Connect a 2W1kΩ resistor between the terminal PC and CS (OH). Install the resistor pushing against the bottom part of the terminal block so as to avoid a contact with other cables.
Refer to Chapter 4 of the Instruction Manual (Applied) for details of Pr. 186 CS terminal function selection.



*9 Assign the function using *Pr. 178 to Pr. 184, Pr. 187 to Pr. 189 (input terminal function selection)*.

*10 When position control is selected, terminal JOG function is invalid and simple position pulse train input terminal becomes valid.

*11 Assign the function using *Pr. 190 to Pr. 194 (output terminal function selection)*.

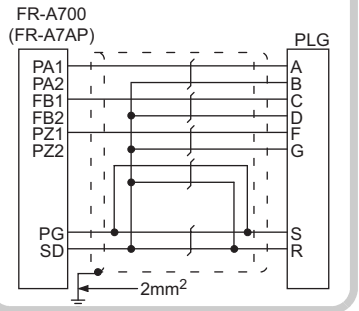
(6) Instructions for encoder cable wiring

• Use twisted pair shield cables (0.2mm^2 or larger) to connect the FR-A7AP and position detector. Cables to terminals PG and SD should be connected in parallel or be larger in size according to the cable length.
To protect the cables from noise, run them away from any source of noise (e.g. the main circuit and power supply voltage).

Wiring Length	Parallel Connection		Larger-Size Cable
Within 10m	At least two cables in parallel	Cable gauge 0.2mm^2	0.4mm^2 or larger
Within 20m	At least four cables in parallel		0.75mm^2 or larger
Within 100m *	At least six cables in parallel		1.25mm^2 or larger

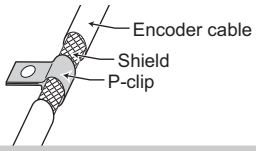
* When differential line driver is set and a wiring length is 30m or more
The wiring length can be extended to 100m by slightly increasing the power by 5V (approx. 5.5V) using six or more cables with gauge size of 0.2mm^2 in parallel or a cable with gauge size of 1.25mm^2 or more. Note that the voltage applied should be within power supply specifications of encoder.

Example of parallel connection with two cables (with complementary encoder output)



• To reduce noise of the encoder cable, earth (ground) the encoder shielded cable to the enclosure (as close as possible to the inverter) with a P-clip or U-clip made of metal.

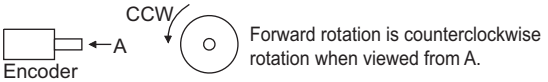
Earthing (grounding) example using a P-clip



REMARKS

- For details of the optional encoder dedicated cable (FR-JCBL/FR-V7CBL), refer to *page 30*.
- The FR-V7CBL is provided with a P clip for earthing (grounding) shielded cable.

(7) Parameter for encoder *(Pr. 359, Pr. 369)*

Parameter Number	Name	Initial Value	Setting Range	Description
359	**Encoder rotation direction**	1	0	 Forward rotation is clockwise rotation when viewed from A.
			1	 Forward rotation is counterclockwise rotation when viewed from A.
369	**Number of encoder pulses**	1024	0 to 4096	Set the number of encoder pulses output. Set the number of pulses before it is multiplied by 4.

The above parameters can be set when the FR-A7AP/FR-A7AL (option) is mounted.

(8) Motor for vector control and parameter setting

Motor Name		*Pr. 9* Electronic thermal O/L relay	*Pr. 71* Applied motor	*Pr. 80* Motor capacity	*Pr. 81* Number of motor poles	*Pr. 359* Encoder rotation direction	*Pr. 369* Number of encoder pulses
Mitsubishi standard motor	SF-JR	Motor rated current	**0**	Motor capacity	Number of motor poles	**1**	**1024**
	SF-JR 4P 1.5kW or less	Motor rated current	20	Motor capacity	4	1	1024
	SF-HR	Motor rated current	40	Motor capacity	Number of motor poles	1	1024
	Others	Motor rated current	3 *1	Motor capacity	Number of motor poles	*2	*2
Mitsubishi constant-torque motor	SF-JRCA 4P	Motor rated current	1	Motor capacity	4	1	1024
	SF-HRCA	Motor rated current	50	Motor capacity	Number of motor poles	1	1024
	Others	Motor rated current	13 *1	Motor capacity	Number of motor poles	*2	*2
Mitsubishi vector control dedicated motor	SF-V5RU (1500r/min series)	0 *3	30	Motor capacity	4	1	2048
	SF-V5RU (except for 1500r/min series)	0 *3	13 *1	Motor capacity	4	1	2048
	SF-THY	0 *3	33 *1	Motor capacity	4	1	2048
Other manufacturer's standard motor	—	Motor rated current	3 *1	Motor capacity	Number of motor poles	*2	*2
Other manufacturer's constant-torque motor	—	Motor rated current	13 *1	Motor capacity	Number of motor poles	*2	*2

Values in the bolded frame are initial values.

*1 Offline auto tuning is necessary. *(Refer to page 71)*
*2 Set this parameter according to the motor (encoder) used.
*3 Use thermal protector input provided with the motor.

(9) Combination with a vector control dedicated motor

Refer to the table below when using with a vector control dedicated motor.

• Combination with the SF-V5RU and SF-THY

Voltage	200V class			400V class		
Rated speed	1500r/min					
Base frequency	50Hz					
Maximum speed	3000r/min					
Motor capacity	Motor frame number	Motor type	Inverter model	Motor frame number	Motor type	Inverter model
1.5kW	90L	SF-V5RU1K	FR-A720-2.2K	90L	SF-V5RUH1K	FR-A740-2.2K
2.2kW	100L	SF-V5RU2K	FR-A720-3.7K	100L	SF-V5RUH2K	FR-A740-2.2K
3.7kW	112M	SF-V5RU3K	FR-A720-5.5K	112M	SF-V5RUH3K	FR-A740-3.7K
5.5kW	132S	SF-V5RU5K	FR-A720-7.5K	132S	SF-V5RUH5K	FR-A740-7.5K
7.5kW	132M	SF-V5RU7K	FR-A720-11K	132M	SF-V5RUH7K	FR-A740-11K
11kW	160M	SF-V5RU11K	FR-A720-15K	160M	SF-V5RUH11K	FR-A740-15K
15kW	160L	SF-V5RU15K	FR-A720-18.5K	160L	SF-V5RUH15K	FR-A740-18.5K
18.5kW	180M	SF-V5RU18K	FR-A720-22K	180M	SF-V5RUH18K	FR-A740-22K
22kW	180M	SF-V5RU22K	FR-A720-30K	180M	SF-V5RUH22K	FR-A740-30K
30kW	200L *2	SF-V5RU30K	FR-A720-37K	200L *2	SF-V5RUH30K	FR-A740-37K
37kW	200L *2	SF-V5RU37K	FR-A720-45K	200L *2	SF-V5RUH37K	FR-A740-45K
45kW	200L *2	SF-V5RU45K	FR-A720-55K	200L *2	SF-V5RUH45K	FR-A740-55K
55kW	225S *1	SF-V5RU55K	FR-A720-75K	225S *1	SF-V5RUH55K	FR-A740-75K
75kW	250MD	SF-THY	FR-A720-90K	250MD	SF-THY	FR-A740-90K
90kW	—	—	—	250MD	SF-THY	FR-A740-110K
110kW	—	—	—	280MD	SF-THY	FR-A740-132K
132kW	—	—	—	280MD	SF-THY	FR-A740-160K
160kW	—	—	—	280MD	SF-THY	FR-A740-185K
200kW	—	—	—	280L	SF-THY	FR-A740-220K
250kW	—	—	—	315H	SF-THY	FR-A740-280K

• Combination with the SF-V5RU1, 3, 4 and SF-THY

	SF-V5RU□1 (1:2)			SF-V5RU□3 (1:3)			SF-V5RU□4 (1:4)		
Voltage	200V class								
Rated speed	1000r/min			1000r/min			500r/min		
Base frequency	33.33Hz			33.33Hz			16.6Hz		
Maximum speed	2000r/min			3000r/min			2000r/min		
Motor capacity	Motor frame number	Motor type	Inverter model	Motor frame number	Motor type	Inverter model	Motor frame number	Motor type	Inverter model
1.5kW	100L	SF-V5RU1K1	FR-A720-2.2K	112M	SF-V5RU1K3	FR-A720-2.2K	132M	SF-V5RU1K4	FR-A720-2.2K
2.2kW	112M	SF-V5RU2K1	FR-A720-3.7K	132S	SF-V5RU2K3	FR-A720-3.7K	160M	SF-V5RU2K4	FR-A720-3.7K
3.7kW	132S	SF-V5RU3K1	FR-A720-5.5K	132M	SF-V5RU3K3	FR-A720-5.5K	160L	SF-V5RU3K4	FR-A720-7.5K
5.5kW	132M	SF-V5RU5K1	FR-A720-7.5K	160M	SF-V5RU5K3	FR-A720-7.5K	180L	SF-V5RU5K4	FR-A720-7.5K
7.5kW	160M	SF-V5RU7K1	FR-A720-11K	160L	SF-V5RU7K3	FR-A720-11K	200L	SF-V5RU7K4	FR-A720-11K
11kW	160L	SF-V5RU11K1	FR-A720-15K	180M	SF-V5RU11K3	FR-A720-15K	225S	SF-V5RU11K4	FR-A720-15K
15kW	180M	SF-V5RU15K1	FR-A720-18.5K	180L	SF-V5RU15K3	FR-A720-18.5K	225S	SF-V5RU15K4	FR-A720-22K
18.5kW	180L	SF-V5RU18K1	FR-A720-22K	200L	SF-V5RU18K3	FR-A720-22K	250MD	SF-THY	FR-A720-22K
22kW	200L	SF-V5RU22K1	FR-A720-30K	200L	SF-V5RU22K3	FR-A720-30K	280MD	SF-THY	FR-A720-30K
30kW	200L*3	SF-V5RU30K1	FR-A720-37K	225S*1	SF-V5RU30K3	FR-A720-37K	280MD	SF-THY	FR-A720-37K
37kW	225S	SF-V5RU37K1	FR-A720-45K	250MD*1	SF-THY	FR-A720-45K	280MD	SF-THY	FR-A720-45K
45kW	250MD	SF-THY	FR-A720-55K	250MD*1	SF-THY	FR-A720-55K	280MD	SF-THY	FR-A720-55K
55kW	250MD	SF-THY	FR-A720-75K	280MD*1	SF-THY	FR-A720-75K	280L	SF-THY	FR-A720-75K

Models surrounded by black borders and 400V class are developed upon receipt of order.

*1 The maximum speed is 2400r/min.

*2 80% output in the high-speed range. (The output is reduced when the speed is 2400r/min or more.)

*3 90% output in the high-speed range. (The output is reduced when the speed is 1000r/min or more.)

2.5 Connection of stand-alone option units

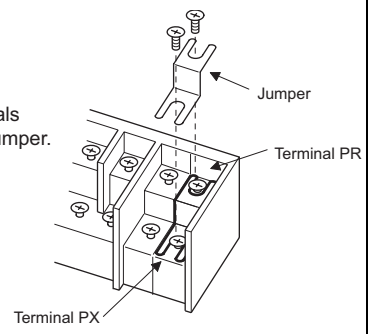
The inverter accepts a variety of stand-alone option units as required.
Incorrect connection will cause inverter damage or accident. Connect and operate the option unit carefully in accordance with the corresponding option unit manual.

2.5.1 Connection of the dedicated external brake resistor (FR-ABR)

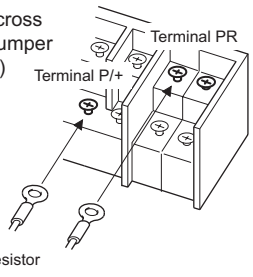
The built-in brake resistor is connected across terminals P/+ and PR. Fit the external dedicated brake resistor (FR-ABR) when the built-in brake resistor does not have enough thermal capability for high-duty operation (22K or lower). At this time, remove the jumper from across terminals PR and PX (7.5K or lower) and connect the dedicated brake resistor (FR-ABR) across terminals P/+ and PR.
(For the locations of terminal P/+ and PR, refer to the terminal block layout *(page 11)*.)
Removing jumpers across terminals PR and PX disables the built-in brake resistor (power is not supplied).
Note that the built-in brake resistor is not need to be removed from the inverter.
The lead wire of the built-in brake resistor is not need to be removed from the terminal.
Set parameters below.
· *Pr. 30 Regenerative function selection* = "1"
· *Pr. 70 Special regenerative brake duty* = "7.5K or lower: 10%, 11K or higher: 6%"

●FR-A720-0.4K to 0.75K

1) Remove the screws in terminals PR and PX and remove the jumper.

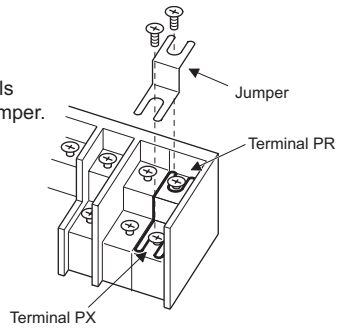


2) Connect the brake resistor across terminals P/+ and PR. (The jumper should remain disconnected.)

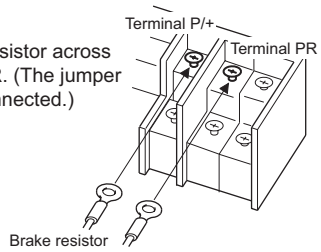


●FR-A720-1.5 to 3.7K, FR-A740-0.4K to 3.7K

1) Remove the screws in terminals PR and PX and remove the jumper.

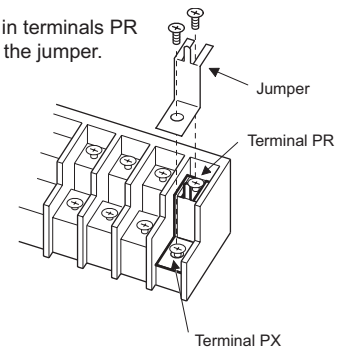


2) Connect the brake resistor across terminals P/+ and PR. (The jumper should remain disconnected.)

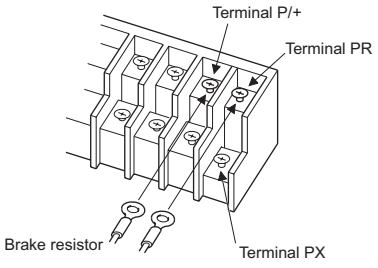


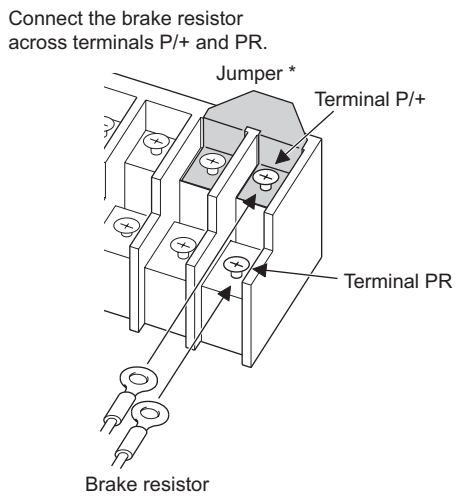
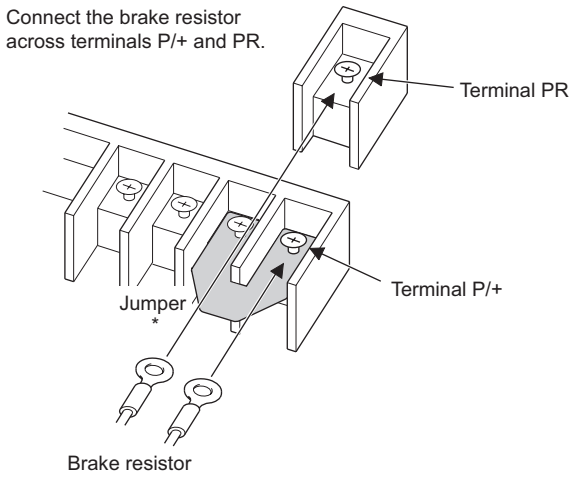
●FR-A720-5.5K, 7.5K, FR-A740-5.5K, 7.5K

1) Remove the screws in terminals PR and PX and remove the jumper.



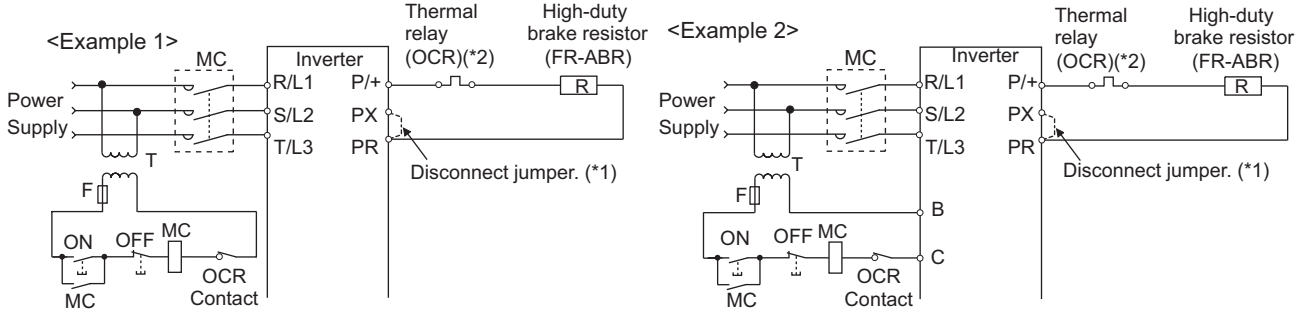
2) Connect the brake resistor across terminals P/+ and PR. (The jumper should remain disconnected.)



●FR-A720-11K, FR-A740-11K, 15K	●FR-A720-15K to 22K, FR-A740-18.5K, 22K
	

* Do not remove the jumper across terminal P/+ and P1 except when connecting a DC reactor.

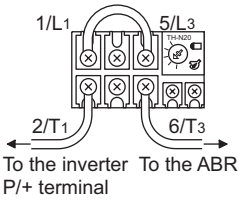
● When the regenerative brake transistor is damaged, the following sequence is recommended to prevent overheat and burnout of the brake resistor.



*1 Since the 11K or higher inverter is not provided with the PX terminal, a jumper is not need to be removed.

*2 Refer to the table below for the type number of each capacity of thermal relay and the diagram below for the connection. (Always install a thermal relay when using the 11K or higher)

Power Supply Voltage	High-Duty Brake Resistor	Thermal Relay Type (Mitsubishi product)	Contact Rating
200V	FR-ABR-0.4K	TH-N20CXHZ-0.7A	110V 5AAC, 220V 2AAC(AC-11 class) 110V 0.5ADC, 220V 0.25ADC(DC-11 class)
	FR-ABR-0.75K	TH-N20CXHZ-1.3A	
	FR-ABR-2.2K	TH-N20CXHZ-2.1A	
	FR-ABR-3.7K	TH-N20CXHZ-3.6A	
	FR-ABR-5.5K	TH-N20CXHZ-5A	
	FR-ABR-7.5K	TH-N20CXHZ-6.6A	
	FR-ABR-11K	TH-N20CXHZ-11A	
	FR-ABR-15K	TH-N20CXHZ-11A	
	FR-ABR-22K	TH-N60-22A	
400V	FR-ABR-H0.4K	TH-N20CXHZ-0.24A	
	FR-ABR-H0.75K	TH-N20CXHZ-0.35A	
	FR-ABR-H1.5K	TH-N20CXHZ-0.9A	
	FR-ABR-H2.2K	TH-N20CXHZ-1.3A	
	FR-ABR-H3.7K	TH-N20CXHZ-2.1A	
	FR-ABR-H5.5K	TH-N20CXHZ-2.5A	
	FR-ABR-H7.5K	TH-N20CXHZ-3.6A	
	FR-ABR-H11K	TH-N20CXHZ-6.6A	
	FR-ABR-H15K	TH-N20CXHZ-6.6A	
	FR-ABR-H22K	TH-N20-9A	



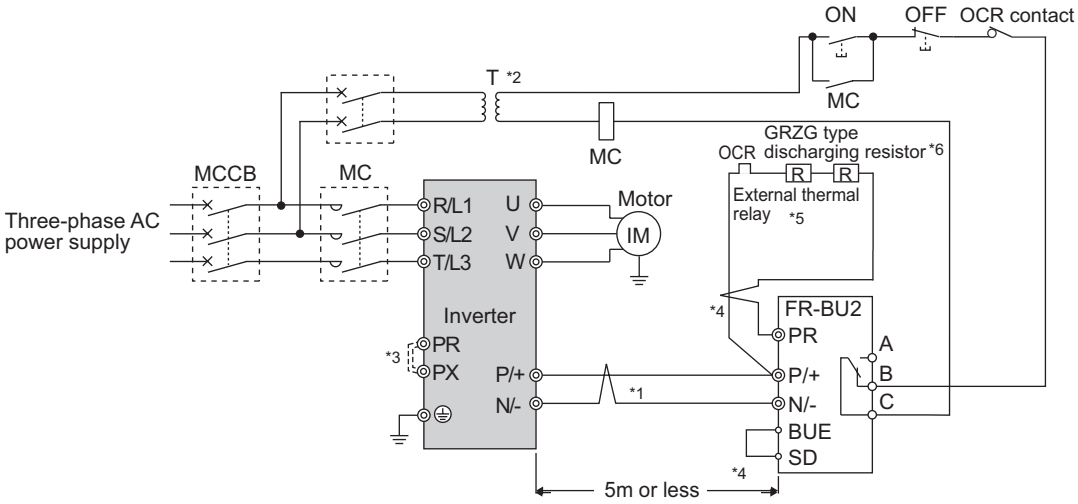
CAUTION

- The brake resistor connected should only be the dedicated brake resistor.
- The jumper across terminals PR and PX (7.5K or lower) must be disconnected before connecting the dedicated brake resistor. Doing so may damage the inverter.
- Brake resistor cannot be used with the brake unit, high power factor converter, power supply regeneration converter, etc.

2.5.2 Connection of the brake unit (FR-BU2)

Connect the brake unit (FR-BU2) as shown below to improve the braking capability at deceleration.

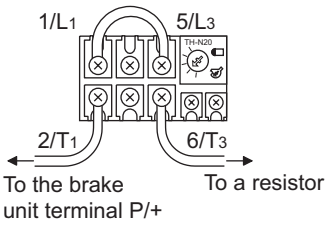
(1) Connection example with the GRZG type discharging resistor



*1 Connect the inverter terminals (P/+, N/-) and brake unit (FR-BU2) terminals so that their terminal names match with each other. (Incorrect connection will damage the inverter and brake unit.)
*2 When the power supply is 400V class, install a step-down transformer.
*3 Be sure to remove the jumper across terminals PR and PX when using the FR-BU2 with the inverter of 7.5K or lower.
*4 Keep a wiring distance of within 5m between the inverter, brake unit (FR-BU2) and discharging resistor. Even when the wiring is twisted, the cable length must not exceed 10m.
*5 It is recommended to install an external thermal relay to prevent overheat of discharging resistors.
*6 Refer to FR-BU2 manual for connection method of discharging resistor.

<Recommended external thermal relay>

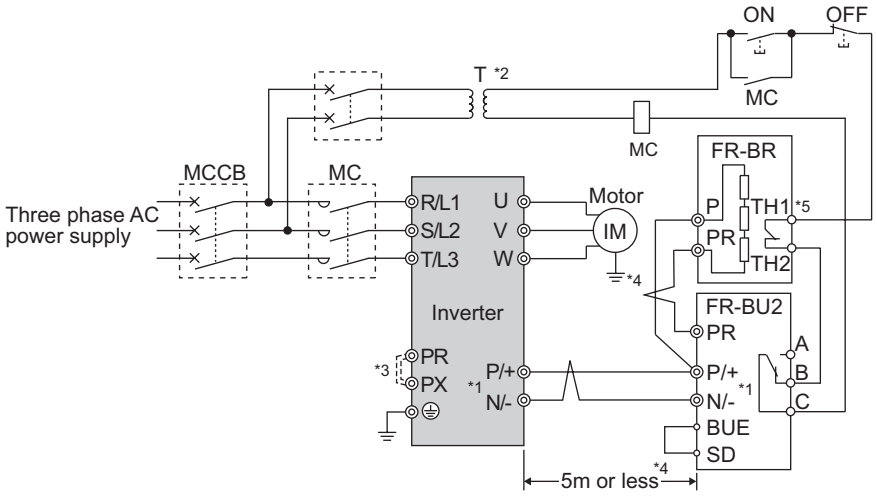
Brake Unit	Discharging Resistor	Recommended External Thermal Relay
FR-BU2-1.5K	GZG 300W-50Ω (one)	TH-N20CXHZ 1.3A
FR-BU2-3.7K	GRZG 200-10Ω (three in series)	TH-N20CXHZ 3.6A
FR-BU2-7.5K	GRZG 300-5Ω (four in series)	TH-N20CXHZ 6.6A
FR-BU2-15K	GRZG 400-2Ω (six in series)	TH-N20CXHZ 11A
FR-BU2-H7.5K	GRZG 200-10Ω (six in series)	TH-N20CXHZ 3.6A
FR-BU2-H15K	GRZG 300-5Ω (eight in series)	TH-N20CXHZ 6.6A
FR-BU2-H30K	GRZG 400-2Ω (twelve in series)	TH-N20CXHZ 11A



CAUTION

- Set "1" in *Pr. 0 Brake mode selection* of the FR-BU2 to use GRZG type discharging resistor.
- Do not remove a jumper across terminal P/+ and P1 except when connecting a DC reactor.

(2) FR-BR-(H) connection example with resistor unit



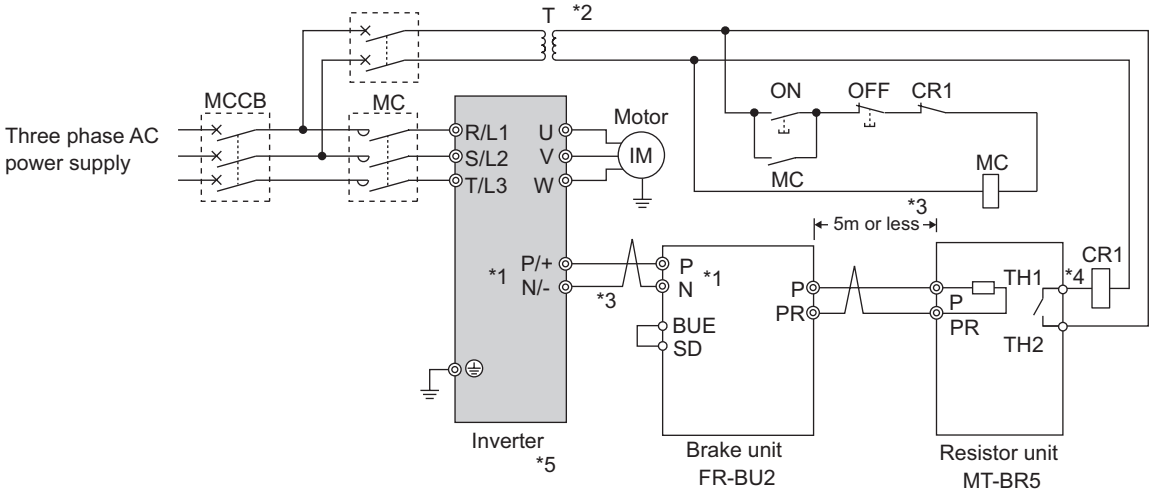
*1 Connect the inverter terminals (P/+, N/-) and brake unit (FR-BU2) terminals so that their terminal names match with each other. (Incorrect connection will damage the inverter and brake unit.)
*2 When the power supply is 400V class, install a step-down transformer.
*3 Be sure to remove the jumper across terminals PR and PX when using the FR-BU with the inverter of 7.5K or lower.
*4 The wiring distance between the inverter, brake unit (FR-BU) and resistor unit (FR-BR) should be within 5m. Even when the wiring is twisted, the cable length must not exceed 10m.
*5 The contact between TH1 and TH2 is closed in the normal status and is open at a fault.

CAUTION

· Do not remove a jumper across terminal P/+ and P1 except when connecting a DC reactor.

(3) Connection example with MT-BR5 type resistor unit

After making sure that the wiring is correct, set the following parameters:
Pr. 30 Regenerative function selection = "1"
Pr. 70 Special regenerative brake duty = "0 (initial value)"
Set *Pr. 0 Brake mode selection* = "2" in the brake unit FR-BU2.



*1 Connect the inverter terminals (P/+, N/-) and brake unit (FR-BU2) terminals so that their terminal names match with each other. (Incorrect connection will damage the inverter and brake unit.)
*2 When the power supply is 400V class, install a step-down transformer.
*3 The wiring distance between the inverter, brake unit (FR-BU2) and resistor unit (MT-BR5) should be within 5m. If twisted wires are used, the distance should be within 10m.
*4 The contact between TH1 and TH2 is open in the normal status and is closed at a fault.
*5 CN8 connector used with the MT-BU5 type brake unit is not used.

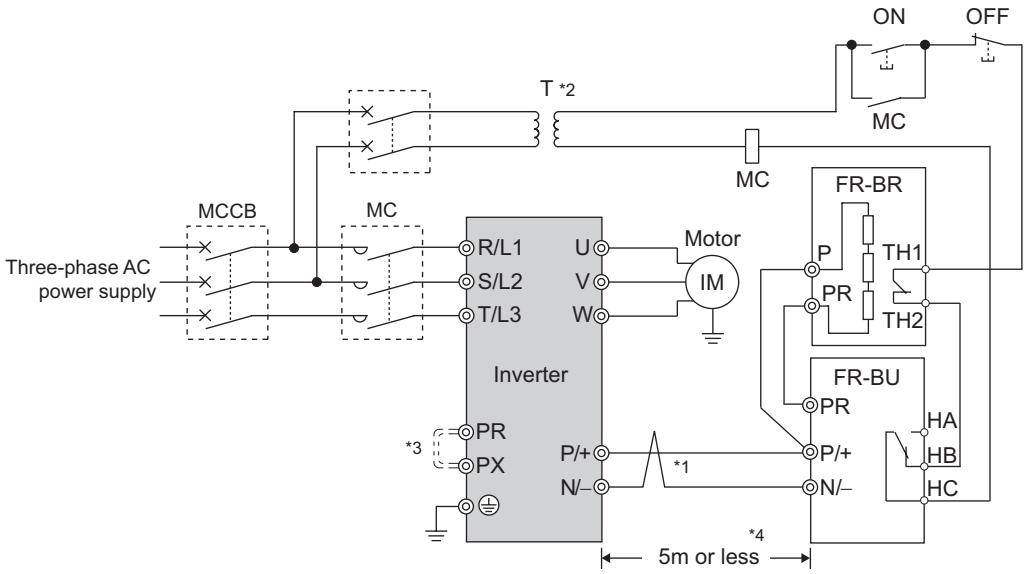
CAUTION

· The stall prevention (overvoltage), oL, does not occur while *Pr.30 Regenerative function selection* = "1" and *Pr.70 Special regenerative brake duty* = "0% (initial setting)."

2.5.3 Connection of the brake unit (FR-BU/MT-BU5)

When connecting the brake unit (FR-BU(H)/MT-BU5) to improve the brake capability at deceleration, make connection as shown below.

(1) Connection with the FR-BU (55K or lower)



*1 Connect the inverter terminals (P/+, N/-) and brake unit (FR-BU (H)) terminals so that their terminal signals match with each other. (Incorrect connection will damage the inverter.)

*2 When the power supply is 400V class, install a step-down transformer.

*3 Be sure to remove the jumper across terminals PR and PX when using the FR-BU with the inverter of 7.5K o lower.

*4 The wiring distance between the inverter, brake unit (FR-BU) and resistor unit (FR-BR) should be within 5m. If twisted wires are used, the distance should be within 10m.

CAUTION

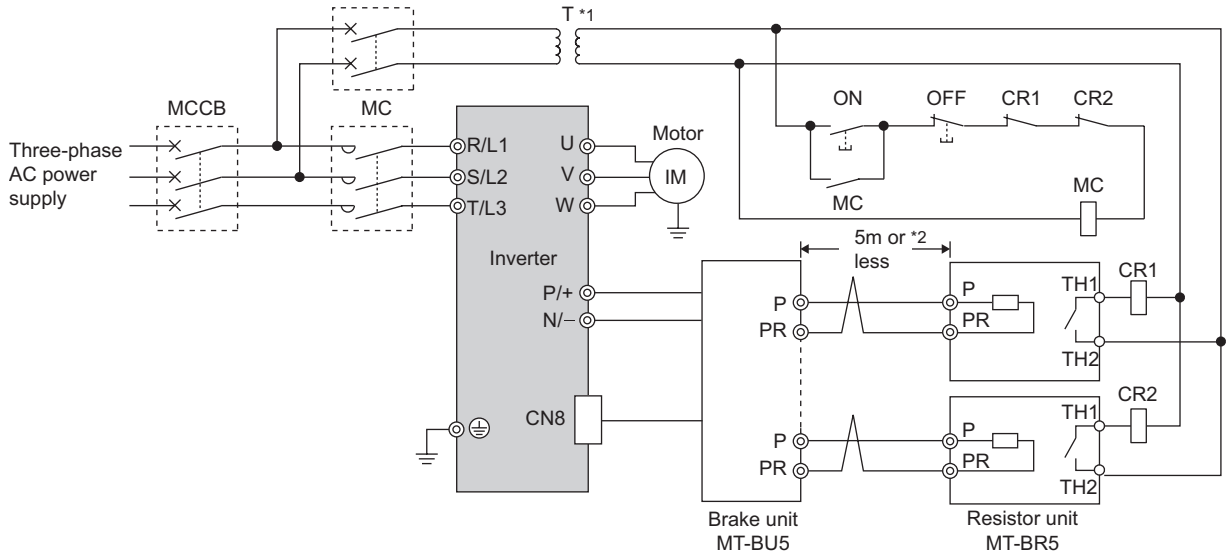
- If the transistors in the brake unit should become faulty, the resistor can be unusually hot, causing a fire. Therefore, install a magnetic contactor on the inverter's input side to configure a circuit so that a current is shut off in case of fault.
- Do not remove a jumper across terminal P/+ and P1 except when connecting a DC reactor.

(2) Connection with the MT-BU5 (75K or higher)

After making sure that the MT-BU5 is properly connected, set the following parameters.

Pr. 30 Regenerative function selection = "1"

Pr. 70 Special regenerative brake duty = "10%"



*1 When the power supply is 400V class, install a step-down transformer.

*2 The wiring length between the resistor unit and brake resistor should be 10m maximum when wires are twisted and 5m maximum when wires are not twisted.

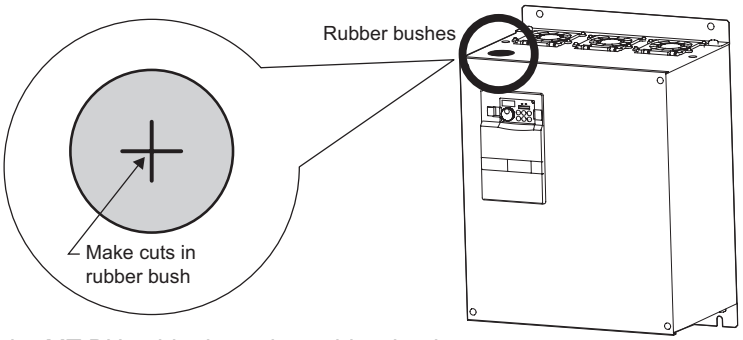
CAUTION

- Install the brake unit in a place where a cooling air reaches the brake unit heatsink and within a distance of the cable supplied with the brake unit reaches the inverter.
- For wiring of the brake unit and inverter, use an accessory cable supplied with the brake unit. Connect the main circuit cable to the inverter terminals P/+ and N/- and connect the control circuit cable to the CN8 connector inside by making cuts in the rubber bush at the top of the inverter for leading the cable.
- The brake unit which uses multiple resistor units has terminals equal to the number of resistor units. Connect one resistor unit to one pair of terminal (P, PR).

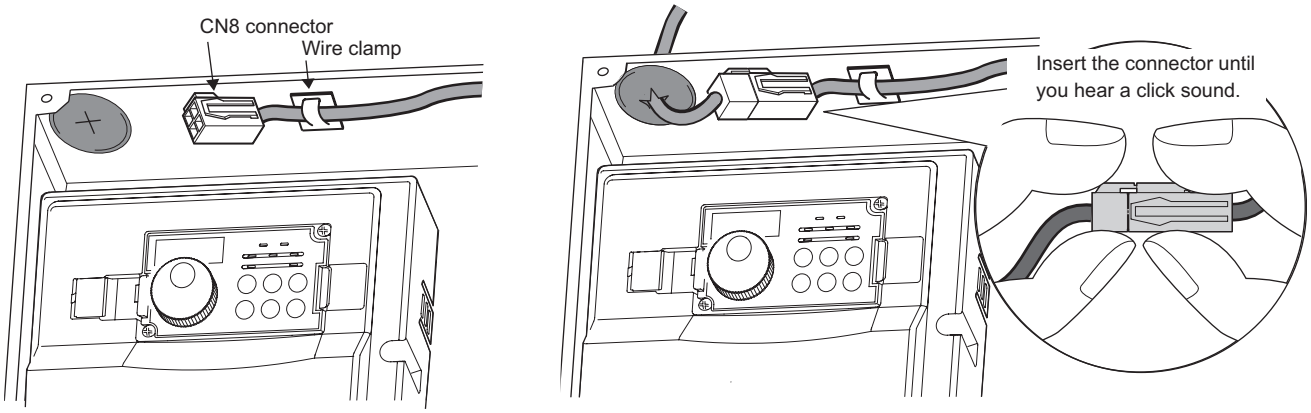
<Inserting the CN8 connector>

Make cuts in rubber bush of the upper portion of the inverter and lead a cable.

1) Make cuts in the rubber bush for leading the CN8 connector cable with a nipper or cutter knife.



2) Insert a connector on the MT-BU5 side through a rubber bush to connect to a connector on the inverter side.

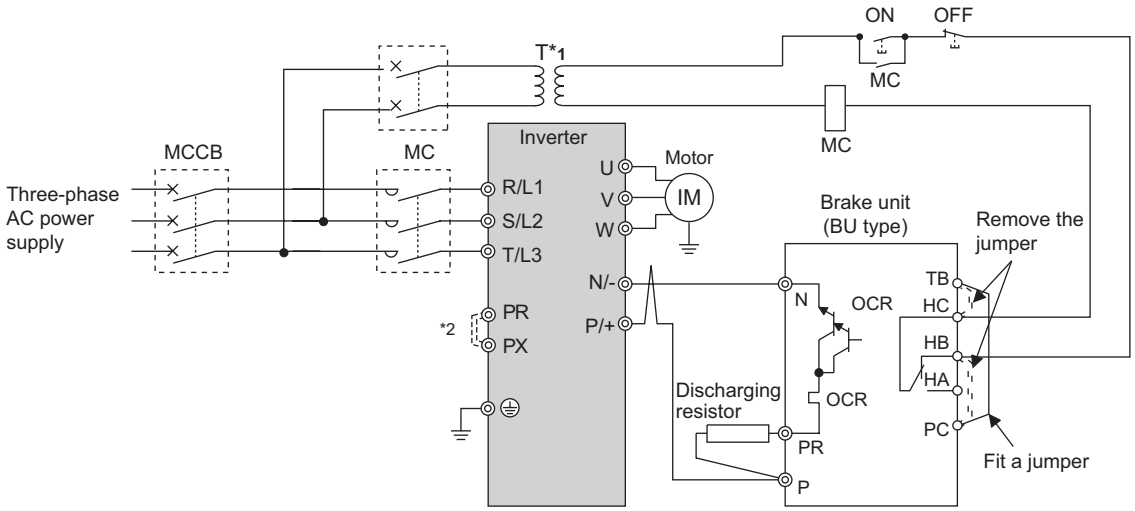


CAUTION

Clamp the CN8 connector cable on the inverter side with a wire clamp securely.
Do not connect the MT-BU5 to a CN8 connector of the FR-A740-55K.

2.5.4 Connection of the brake unit (BU type)

Connect the brake unit (BU type) correctly as shown below. Incorrect connection will damage the inverter. Remove the jumper across terminals HB-PC and terminals TB-HC of the brake unit and fit it to across terminals PC-TB.



*1 When the power supply is 400V class, install a step-down transformer.
*2 For capacity 7.5K or lower, remove the jumper across terminals PR and PX.

CAUTION

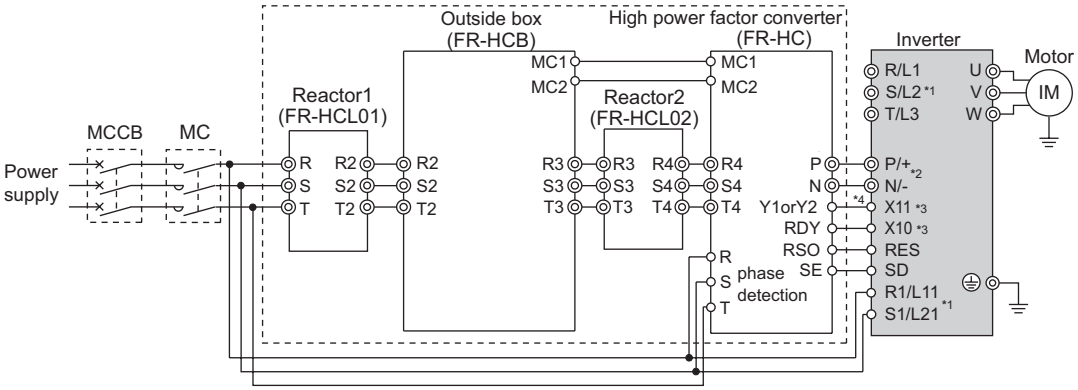
- The wiring distance between the inverter, brake unit and resistor unit should be within 2m . If twisted wires are used, the distance should be within 5m.
- If the transistors in the brake unit should become faulty, the resistor can be unusually hot, causing a fire. Therefore, install a magnetic contactor on the inverter's power supply side to configure a circuit so that a current is shut off in case of fault.
- Do not remove a jumper across terminal P/+ and P1 except when connecting a DC reactor.

2.5.5 Connection of the high power factor converter (FR-HC/MT-HC)

When connecting the high power factor converter (FR-HC/MT-HC) to suppress power harmonics, perform wiring securely as shown below.
Incorrect connection will damage the high power factor converter and inverter.
After making sure that the wiring is correct, set "2" in *Pr. 30 Regenerative function selection*.

(1) Connection with the FR-HC (55K or lower)

After making sure the wiring is correct, set the following parameters.
Pr. 19 Base frequency voltage (under V/F control) or *Pr. 83 Rated motor voltage* (under a control method other than V/F control) = "rated motor voltage"
Pr. 30 Regenerative function selection = "2"



*1 Remove the jumpers across the inverter terminals R/L1 and R1/L11, S/L2 and S1/L21, and connect the control circuit power supply to the R1/L11 and S1/L21 terminals. Always keep the power input terminals R/L1, S/L2, T/L3 open. Incorrect connection will damage the inverter. (E.OPT (option alarm) will occur. (*Refer to page 147.*))
*2 Do not insert the MCCB between terminals P/+ and N/- (P/+ and P/+, N/- and N/-). Opposite polarity of terminals N/-, P/+ will damage the inverter.
*3 Use *Pr. 178 to Pr. 189 (input terminal function selection)* to assign the terminals used for the X10 (X11) signal. (*Refer to page 117*)
For communication where the start command is sent only once, e.g. RS-485 communication operation, use the X11 signal when making setting to hold the mode at occurrence of an instantaneous power failure.
*4 Always connect the terminal RDY (of FR-HC) to a terminal where the X10 or MRS signal is assigned in the inverter. Always connect the terminal SE (of FR-HC) to the terminal SD (of the inverter). Not doing so may damage FR-HC.

CAUTION

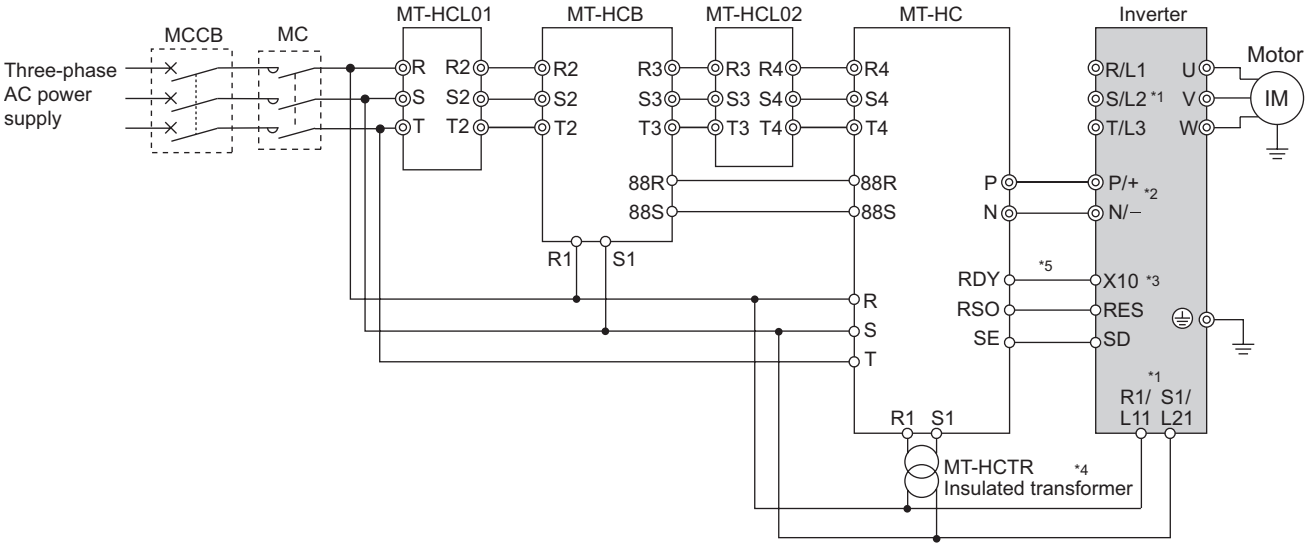
- The voltage phases of terminals R/L1, S/L2, T/L3 and terminals R4, S4, T4 must be matched.
- Use sink logic (factory setting) when the FR-HC is connected. The FR-HC cannot be connected when source logic is selected.
- Do not connect a DC reactor to the inverter when FR-HC is connected.
- Do not remove the jumper across P/+ and P1.

(2) Connection with the MT-HC (75K or higher)

After making sure the wiring is correct, set the following parameters.

Pr. 19 Base frequency voltage (under V/F control) or *Pr. 83 Rated motor voltage* (under a control method other than V/F control) = "rated motor voltage"

Pr. 30 Regenerative function selection = "2"



*1 Remove the jumper across terminals R/L1 and R1/L11, S/L2 and S1/L21 of the inverter, and connect the control circuit power supply to the R1/L11 and S1/L21 terminals. The power input terminals R/L1, S/L2, T/L3 must be open. Incorrect connection will damage the inverter. (E.OPT (option alarm) will occur. (*Refer to page 147.*)

*2 Do not insert the MCCB between terminals P/+ and N/- (P and P/+, N and N/-). Opposite polarity of terminals N, P will damage the inverter.

*3 Use *Pr. 178 to Pr. 189 (input terminal function selection)* to assign the terminals used for the X10 (X11) signal. (*Refer to page 117.)* For communication where the start command is sent only once, e.g. RS-485 communication operation, use the X11 signal when making setting to hold the mode at occurrence of an instantaneous power failure.

*4 Connect the power supply to terminals R1 and S1 of the MT-HC via an insulated transformer.

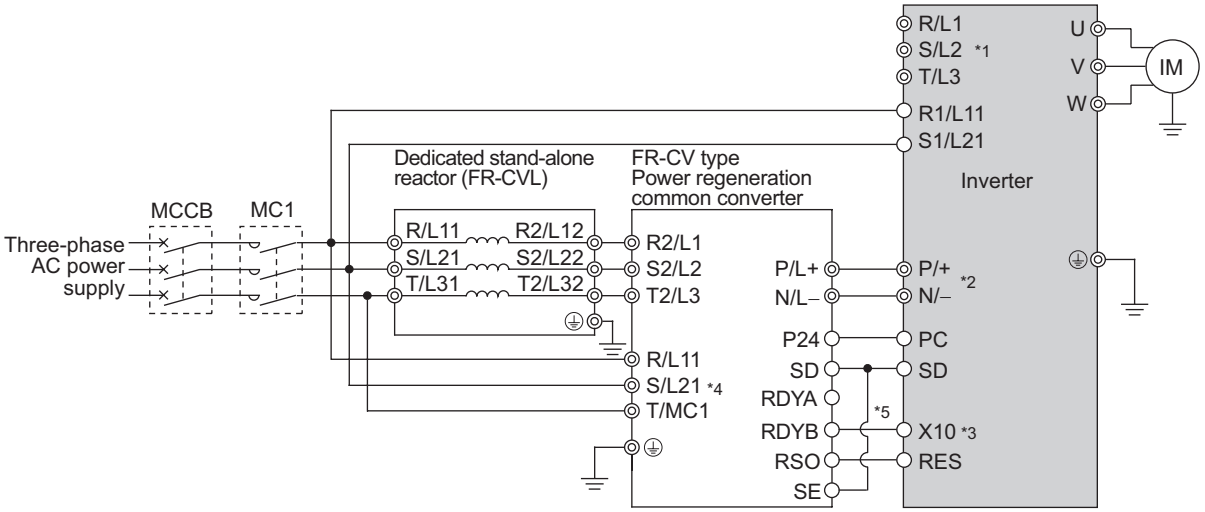
*5 Always connect the terminal RDY (of MT-HC) to a terminal where the X10 or MRS signal is assigned in the inverter. Always connect the terminal SE (of MT-HC) to the terminal SD (of the inverter). Not doing so may damage MT-HC.

CAUTION

- The voltage phases of terminals R/L1, S/L2, T/L3 and terminals R4, S4, T4 must be matched.
- Use sink logic (factory setting) when the MT-HC is connected. The MT-HC cannot be connected when source logic is selected.
- When connecting the inverter to the MT-HC, do not connect the DC reactor provided to the inverter.

2.5.6 Connection of the power regeneration common converter (FR-CV)

When connecting the power regeneration common converter (FR-CV), make connection so that the inverter terminals (P/+, N/-) and the terminal symbols of the power regeneration common converter (FR-CV) are the same (55K or lower). After making sure that the wiring is correct, set "2" in *Pr. 30 Regenerative function selection*.



*1 Remove the jumpers across terminals R/L1 and R1/L11 and S/L2 and S1/L21 of the inverter, and connect the control circuit power supply across terminals R1/L11 and S1/L21. Always keep the power input terminals R/L1, S/L2, T/L3 open. Incorrect connection will damage the inverter. (E.OPT (option alarm) will occur. *(Refer to page 147)*)

*2 Do not insert the MCCB between the terminals P/+ and N/- (between P/L+ and P/+, between N/L- and N/-). Opposite polarity of terminals N/-, P/+ will damage the inverter.

*3 Assign the terminal for X10 signal using any of *Pr. 178 to Pr. 189 (input terminal function selection)*. *(Refer to page 117)*

*4 Be sure to connect the power supply and terminals R/L11, S/L21, T/MC1.
Operating the inverter without connecting them will damage the power regeneration common converter.

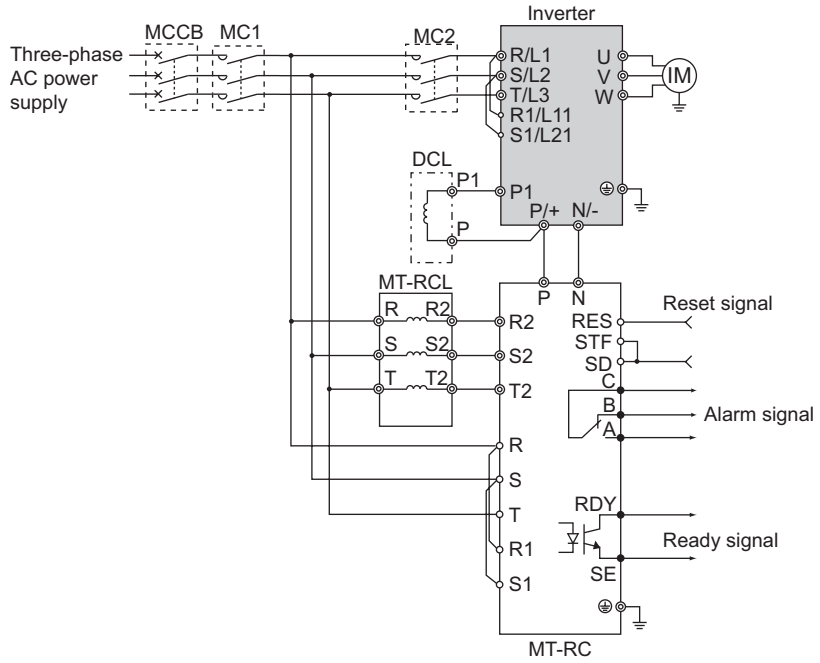
*5 Always connect the terminal RDYB (of FR-CV) to a terminal where the X10 or MRS signal is assigned in the inverter. Always connect the terminal SE (of FR-CV) to the terminal SD (of the inverter). Not doing so may damage FR-CV.

CAUTION

- The voltage phases of terminals R/L11, S/L21, T/MC1 and terminals R2/L1, S2/L2, T2/L3 must be matched.
- Use sink logic (factory setting) when the FR-CV is connected. The FR-CV cannot be connected when source logic is selected.
- Do not connect a DC reactor to the inverter when FR-CV is connected.
- Do not remove a jumper across terminal P/+ and P1.

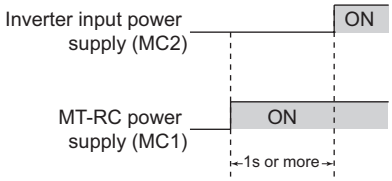
2.5.7 Connection of power regeneration converter (MT-RC)

When connecting a power regeneration converter (MT-RC), perform wiring securely as shown below. Incorrect connection will damage the regeneration converter and inverter. After connecting securely, set "1" in *Pr. 30 Regenerative function selection* and "0" in *Pr. 70 Special regenerative brake duty*.



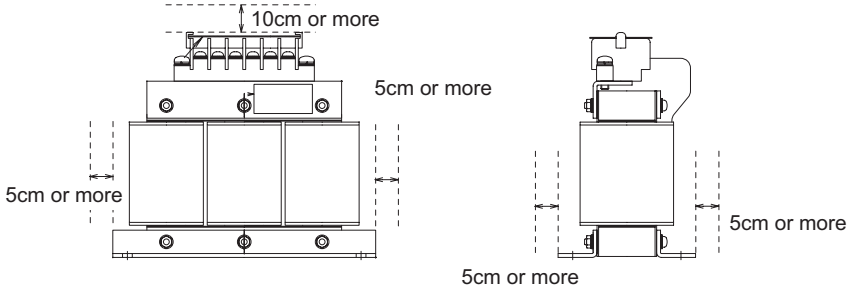
CAUTION

- When using the FR-A700 series together with the MT-RC, install a magnetic contactor (MC) at the input side of the inverter so that power is supplied to the inverter after 1s or more has elapsed after powering ON the MT-RC. When power is supplied to the inverter prior to the MT-RC, the inverter and the MT-RC may be damaged or the MCCB may trip or be damaged.
- Refer to the MT-RC manual for precautions for connecting the power coordination reactor and others.

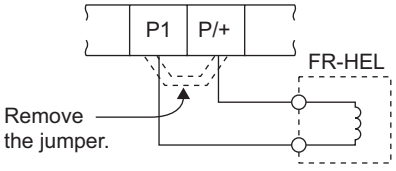


2.5.8 Connection of the power factor improving DC reactor (FR-HEL)

(1) Keep the surrounding air temperature within the permissible range (-10°C to +50°C). Keep enough clearance around the reactor because it heats up. (Take 10cm or more clearance on top and bottom and 5cm or more on left and right regardless of the installation direction.)



(2) When using the DC reactor (FR-HEL), connect it between terminals P1 and P/+.
For the 55K or lower, the jumper connected across terminals P1 and P/+ must be removed. Otherwise, the reactor will not exhibit its performance.
For the 75K or higher, a DC reactor is supplied. Always install the reactor.



CAUTION

- The wiring distance should be within 5m.
- The size of the cables used should be equal to or larger than that of the power supply cables (R/L1, S/L2, T/L3). *(Refer to page 14)*

2.6 Power-off and magnetic contactor (MC)

(1) Inverter input side magnetic contactor (MC)

On the inverter input side, it is recommended to provide an MC for the following purposes.

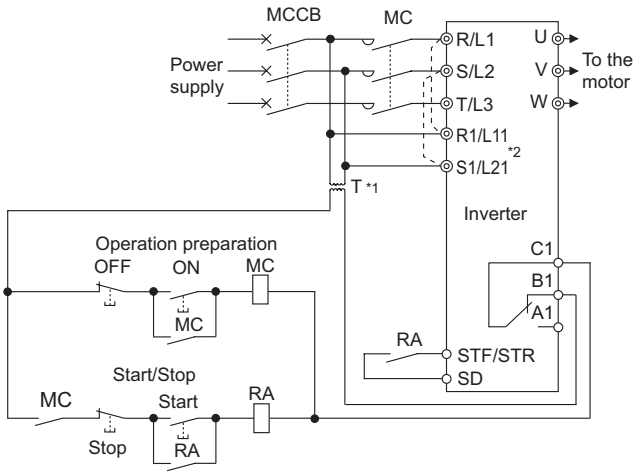
(*Refer to page 4* for selection.)

1) To release the inverter from the power supply when a fault occurs or when the drive is not functioning (e.g. emergency stop operation). For example, MC avoids overheat or burnout of the brake resistor when heat capacity of the resistor is insufficient or brake regenerative transistor is damaged with short while connecting an optional brake resistor.
2) To prevent any accident due to an automatic restart at restoration of power after an inverter stop made by a power failure
3) To separate the inverter from the power supply to ensure safe maintenance and inspection work

The inverter's input side MC is used for the above purpose, select class JEM1038-AC3MC for the inverter input side current when making an emergency stop during normal operation.

REMARKS

Since repeated inrush currents at power ON will shorten the life of the converter circuit (switching life is about 1,000,000 times. (For the 200V class 37K or higher, switching life is about 500,000)), frequent starts and stops of the MC must be avoided. Turn on/off the inverter start controlling terminals (STF, STR) to run/stop the inverter.



• Inverter start/stop circuit example

As shown on the left, always use the start signal (ON or OFF of STF (STR) signal) to make a start or stop.

*1 When the power supply is 400V class, install a step-down transformer.

*2 Connect the power supply terminals R1/L11, S1/L21 of the control circuit to the primary side of the MC to hold an alarm signal when the inverter's protective circuit is activated. At this time, remove jumpers across terminals R/L1 and R1/L11 and S/L2 and S1/L21. (Refer to *page 17* for removal of the jumper.)

(2) Handling of the inverter output side magnetic contactor

Switch the magnetic contactor between the inverter and motor only when both the inverter and motor are at a stop. When the magnetic contactor is turned ON while the inverter is operating, overcurrent protection of the inverter and such will activate. When an MC is provided to switch to a commercial power supply, for example, it is recommended to use bypass operation *Pr. 135 to Pr. 139 (Chapter 4 of the Instruction Manual (Applied))*.

2.7 Precautions for use of the inverter

The FR-A700 series is a highly reliable product, but incorrect peripheral circuit making or operation/handling method may shorten the product life or damage the product.
Before starting operation, always recheck the following items.

(1) Use crimping terminals with insulation sleeve to wire the power supply and motor.

(2) Application of power to the output terminals (U, V, W) of the inverter will damage the inverter. Never perform such wiring.

(3) After wiring, wire offcuts must not be left in the inverter.
Wire offcuts can cause an alarm, failure or malfunction. Always keep the inverter clean. When drilling mounting holes in an enclosure etc., take care not to allow chips and other foreign matter to enter the inverter.

(4) Use cables of the size to make a voltage drop 2% maximum.
If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency.
Refer to *page 14* for the recommended cable sizes.

(5) The overall wiring length should be 500m maximum.
(The wiring length should be 100m maximum for vector control.)
Especially for long distance wiring, the fast-response current limit function may decrease or the equipment connected to the secondary side may malfunction or become faulty under the influence of a charging current due to the stray capacity of the wiring. Therefore, note the overall wiring length. *(Refer to page 16.)*

(6) Electromagnetic wave interference
The input/output (main circuit) of the inverter includes high frequency components, which may interfere with the communication devices (such as AM radios) used near the inverter. In this case, set the EMC filter valid to minimize interference. *(Refer to page 10)*

(7) Do not install a power factor correction capacitor, surge suppressor or radio noise filter on the inverter output side.
This will cause the inverter to trip or the capacitor, and surge suppressor to be damaged. If any of the above devices is installed, immediately remove it.

(8) For some short time after the power is switched OFF, a high voltage remains in the smoothing capacitor.
When accessing the inverter for inspection, wait for at least 10 minutes after the power supply has been switched OFF, and then make sure that the voltage across the main circuit terminals P/+ and N/- of the inverter is not more than 30VDC using a tester, etc.

(9) A short circuit or earth (ground) fault on the inverter output side may damage the inverter modules.
- Fully check the insulation resistance of the circuit prior to inverter operation since repeated short circuits caused by peripheral circuit inadequacy or an earth (ground) fault caused by wiring inadequacy or reduced motor insulation resistance may damage the inverter modules.
- Fully check the to-earth (ground) insulation and phase to phase insulation of the inverter output side before power-on. Especially for an old motor or use in hostile atmosphere, securely check the motor insulation resistance etc.

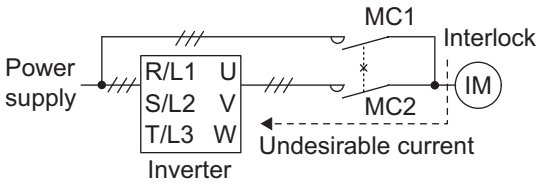
(10) Do not use the inverter input side magnetic contactor to start/stop the inverter.
Since repeated inrush currents at power ON will shorten the life of the converter circuit (switching life is about 1,000,000 times. (For the 200V class 37K or higher, switching life is about 500,000)), frequent starts and stops of the MC must be avoided.
Always use the start signal (ON/OFF of STF and STR signals) to start/stop the inverter. *(Refer to page 9)*

(11) Across P/+ and PR terminals, connect only an external regenerative brake discharge resistor.
Do not connect a mechanical brake.

(12) Do not apply a voltage higher than the permissible voltage to the inverter I/O signal circuits.
Application of a voltage higher than the permissible voltage to the inverter I/O signal circuits or opposite polarity may damage the I/O devices. Especially check the wiring to prevent the speed setting potentiometer from being connected incorrectly to short across terminals 10E and 5.

(13) Provide electrical and mechanical interlocks for MC1 and MC2 which are used for bypass operation.

When the wiring is incorrect or if there is an electronic bypass circuit as shown on the right, the inverter will be damaged by leakage current from the power supply is connected to the inverter U, V, W terminals due to arcs generated at the time of switch-over or chattering caused by a sequence error.
(Commercial operation can not be performed with the vector dedicated motor (SF-V5RU, SF-THY).)



(14) If the machine must not be restarted when power is restored after a power failure, provide a magnetic contactor in the inverter's input side and also make up a sequence which will not switch ON the start signal.

If the start signal (start switch) remains ON after a power failure, the inverter will automatically restart as soon as the power is restored.

(15) A motor with encoder is necessary for vector control. In addition, connect the encoder directly to the backlash-free motor shaft. (An encoder is not necessary for Real sensorless vector control.)

(16) Inverter input side magnetic contactor (MC)

On the inverter input side, connect a MC for the following purposes. (*Refer to page 4* for selection.)

1)To release the inverter from the power supply when a fault occurs or when the drive is not functioning (e.g. emergency stop operation). For example, MC avoids overheat or burnout of the brake resistor when heat capacity of the resistor is insufficient or brake regenerative transistor is damaged with short while connecting an optional brake resistor.

2)To prevent any accident due to an automatic restart at restoration of power after an inverter stop made by a power failure

3)To separate the inverter from the power supply to ensure safe maintenance and inspection work.
The inverter's input side MC is used for the above purpose, select class JEM1038-AC3 MC for the inverter input side current when making an emergency stop during normal operation.

(17) Handling of inverter output side magnetic contactor

Switch the magnetic contactor between the inverter and motor only when both the inverter and motor are at a stop. When the magnetic contactor is turned ON while the inverter is operating, overcurrent protection of the inverter and such will activate. When MC is provided for switching to the commercial power supply, for example, switch it ON/OFF after the inverter and motor have stopped.

(18) Countermeasures against inverter-generated EMI

If electromagnetic noise generated from the inverter causes frequency setting signal to fluctuate and motor rotation speed to be unstable when changing motor speed with analog signal, the following countermeasures are effective.

· Do not run the signal cables and power cables (inverter I/O cables) in parallel with each other and do not bundle them.
· Run signal cables as far away as possible from power cables (inverter I/O cables).
· Use shield cables as signal cables.
· Install a ferrite core on the signal cable (Example: ZCAT3035-1330 TDK).

(19) Instructions for overload operation

When performing an operation of frequent start/stop with the inverter, rise/fall in the temperature of the transistor element of the inverter will repeat due to a continuous flow of large current, shortening the life from thermal fatigue. Since thermal fatigue is related to the amount of current, the life can be increased by reducing current at locked condition, starting current, etc. Decreasing current may increase the life. However, decreasing current will result in insufficient torque and the inverter may not start. Therefore, choose the inverter which has enough allowance for current (up to 2 rank larger in capacity).

(20) Make sure that the specifications and rating match the system requirements.

2.8 Failsafe of the system which uses the inverter

When a fault occurs, the inverter trips to output a fault signal. However, a fault output signal may not be output at an inverter fault occurrence when the detection circuit or output circuit fails, etc. Although Mitsubishi assures best quality products, provide an interlock which uses inverter status output signals to prevent accidents such as damage to machine when the inverter fails for some reason and at the same time consider the system configuration where failsafe from outside the inverter, without using the inverter, is enabled even if the inverter fails.

(1) Interlock method which uses the inverter status output signals

By combining the inverter status output signals to provide an interlock as shown below, an inverter alarm can be detected.

No.	Interlock Method	Check Method	Used signals	Refer to Page
1)	Inverter protective function operation	Operation check of an alarm contact Circuit error detection by negative logic	Fault output signal ALM signal	*Refer to Chapter 4 of the Instruction Manual (Applied).*
2)	Inverter running status	Operation ready signal check	Operation ready signal (RY signal)	*Refer to Chapter 4 of the Instruction Manual (Applied).*
3)	Inverter running status	Logic check of the start signal and running signal	Start signal (STF signal, STR signal) Running signal (RUN signal)	*Refer to Chapter 4 of the Instruction Manual (Applied).*
4)	Inverter running status	Logic check of the start signal and output current	Start signal (STF signal, STR signal) Output current detection signal Y12 signal	*Refer to Chapter 4 of the Instruction Manual (Applied).*

(2) Backup method outside the inverter

Even if the interlock is provided by the inverter status signal, enough failsafe is not ensured depending on the failure status of the inverter itself. For example, when the inverter CPU fails, even if the interlock is provided using the inverter fault signal, start signal and RUN signal, there is a case where a fault signal is not output and RUN signal is kept output even if an inverter fault occurs.

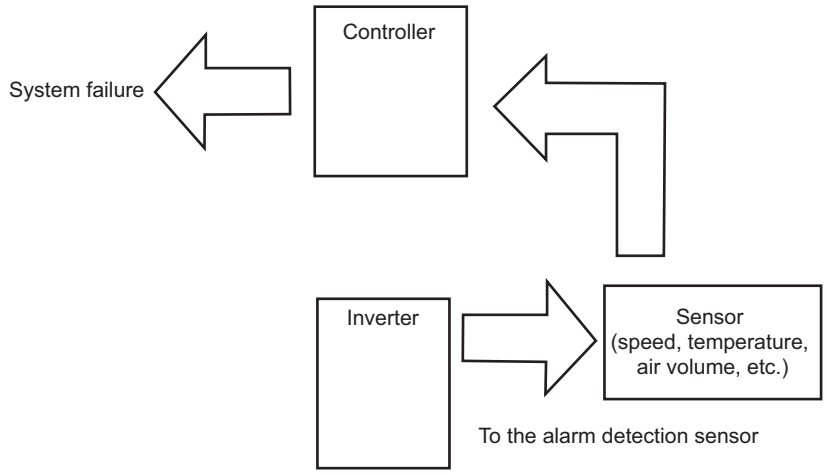
Provide a speed detector to detect the motor speed and current detector to detect the motor current and consider the backup system such as checking up as below according to the level of importance of the system.

1) Start signal and actual operation check

Check the motor running and motor current while the start signal is input to the inverter by comparing the start signal to the inverter and detected speed of the speed detector or detected current of the current detector. Note that the motor current runs as the motor is running for the period until the motor stops since the inverter starts decelerating even if the start signal turns off. For the logic check, configure a sequence considering the inverter deceleration time. In addition, it is recommended to check the three-phase current when using the current detector.

2) Command speed and actual operation check

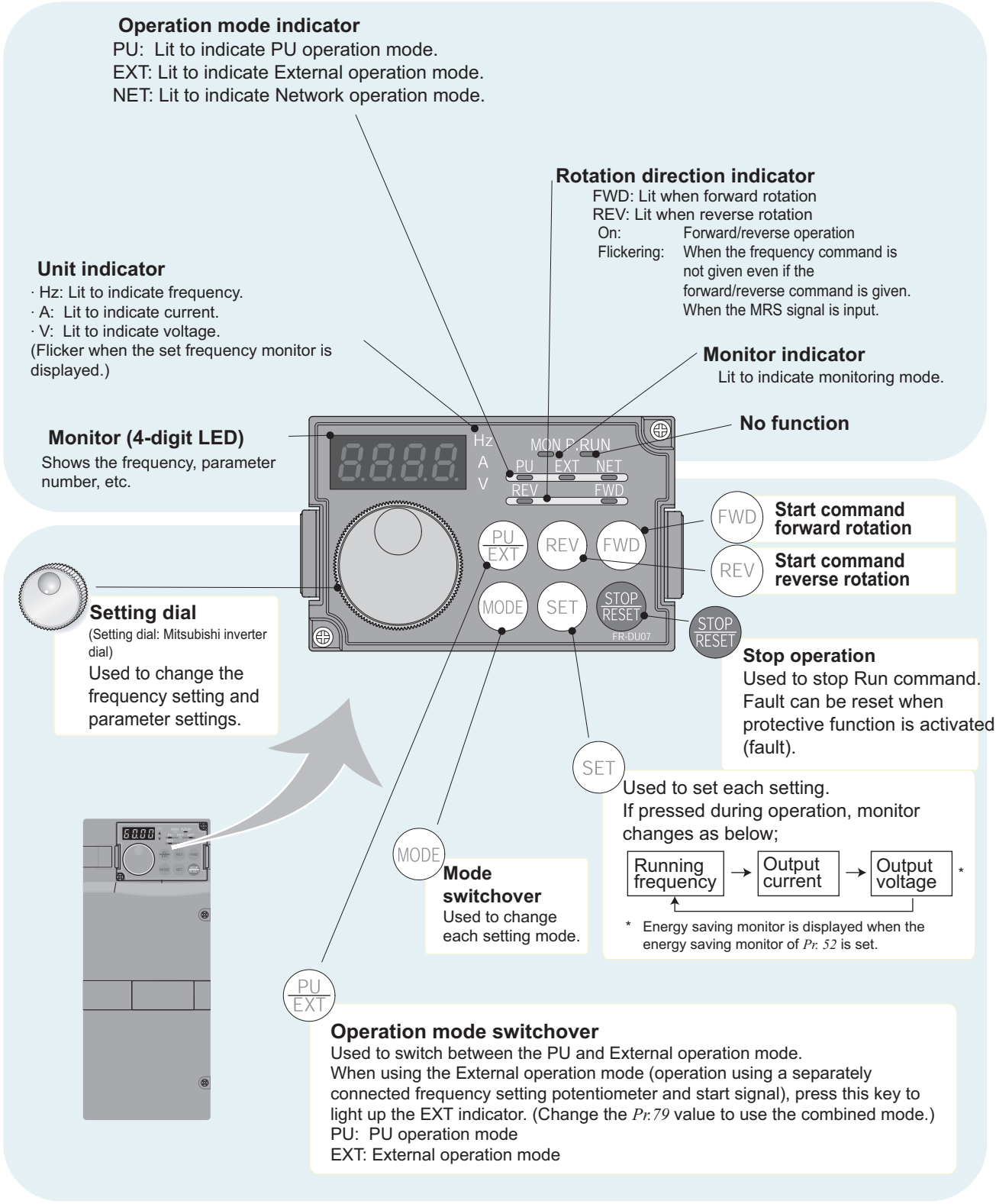
Check if there is no gap between the actual speed and commanded speed by comparing the inverter speed command and detected speed of the speed detector.



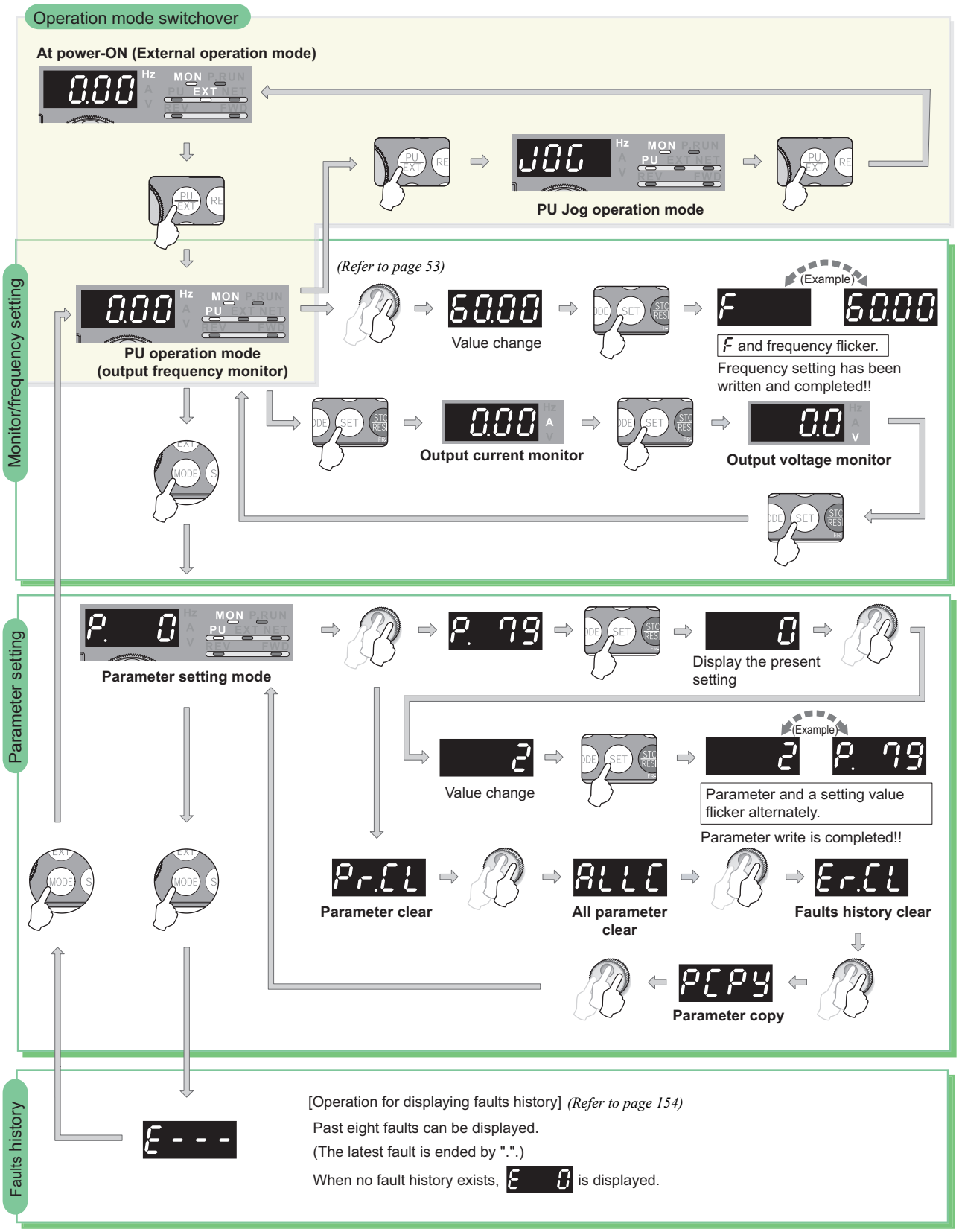
3 DRIVING THE MOTOR

3.1 Operation panel (FR-DU07)

3.1.1 Parts of the operation panel (FR-DU07)



3.1.2 Basic operation (factory setting)



3.1.3 Operation lock (Press [MODE] for an extended time (2s))

Operation using the setting dial and key of the operation panel can be set invalid to prevent parameter change, and unexpected start or frequency setting.

- Set "10 or 11" in *Pr. 161*, then press (MODE) for 2s to make the setting dial and key operation invalid.
- When the setting dial and key operation are invalid, HOLd appears on the operation panel.

  If dial or key operation is attempted while dial and key operation are invalid, HOLd appears. (When dial or key is not touched for 2s, the monitor display appears.)
- To make the setting dial and key operation valid again, press (MODE) for 2s.

POINT

Set "10 or 11" (key lock valid) in *Pr.161 Frequency setting/key lock operation selection*.

Operation

1. Screen at power-ON
   The monitor display appears.
2. Operation mode change
   Press (PU/EXT) to choose the PU operation mode. [PU] indicator is lit.
3. Parameter setting mode
   Press (MODE) to choose the parameter setting mode. (The parameter number read previously appears.)
4. Selecting the parameter number
   Turn dial until P.161 (*Pr. 161*) appears. Press (SET) to read the present set value. "0" (initial value) appears.
5. Changing the setting value
   Turn to dial change it to the setting value " 10". Press (SET) to set. " 10" and " P.161 " flicker alternately.
6. Press (MODE) for 2s to activate the key lock. HOLd appears.

Functions valid even in the operation lock status

Stop and reset with (STOP/RESET).

CAUTION

Release the operation lock to release the PU stop by key operation.

3.1.4 Monitoring of output current and output voltage

POINT

Monitor display of output frequency, output current and output voltage can be changed by pushing (SET) during monitoring mode.

Operation

1. Press (MODE) during operation to choose the output frequency monitor. [Hz] indicator is lit.
2. Independently of whether the inverter is running in any operation mode or at a stop, the output current monitor appears by pressing (SET). [A] indicator is lit.
3. Press (SET) to show the output voltage monitor. [V] indicator is lit.

REMARKS

Monitored item can be changed from output voltage to other items such as output power and set frequency by setting *Pr. 52*. *Refer to Chapter 4 of the Instruction Manual (Applied)*.

3.1.5 First priority monitor

Hold down (SET) for 1s to set monitor description to be appeared first in the monitor mode.

(To return to the output frequency monitor, hold down (SET) for 1s after displaying the output frequency monitor.)

3.1.6 Displaying the set frequency

Press the setting dial () in the PU operation mode or in the External/PU combined operation mode 1 (*Pr. 79* = "3") to show the set frequency.

3.1.7 Changing the parameter setting value

Changing example | Change the *Pr. 1 Maximum frequency* .

Operation

1. Screen at power-ON
The monitor display appears.

2. Operation mode change
Press (PU/EXT) to choose the PU operation mode. [PU] indicator is lit.

3. Parameter setting mode
Press (MODE) to choose the parameter setting mode. (The parameter number read previously appears.)

4. Selecting the parameter
Turn the dial until "P. 1" (*Pr. 1*) appears. Press (SET) to read the present set value. "120.0" (initial value) appears.

5. Changing the setting value
Turn the dial to change it to the set value "60.00". Press (SET) to set. "60.00" and "P. 1" flicker alternately.

- By turning the dial, you can read another parameter.
- Press (SET) to show the setting again.
- Press (SET) twice to show the next parameter.
- Press (MODE) twice to return the monitor to frequency monitor.

? "Er 1" to "Er 4" are displayed ... Why?

☞ Er 1 appears. .....Write disable error
Er 2 appears. .....Write error during operation
Er 3 appears. .....Calibration error
Er 4 appears. .....Mode designation error

For details refer to *page 139*.

REMARKS

The number of digits displayed on the operation panel (FR-DU07) is four.
If the values to be displayed have five digits or more including decimal places, the fifth or later numerals can not be displayed nor set.

(Example) When *Pr. 1*
When 60Hz is set, 60.00 is displayed.
When 120Hz is set, 120.0 is displayed and second decimal place is not displayed nor set.

3.1.8 Parameter clear, all parameter clear

POINT

- Set "1" in *Pr. CL parameter clear* or *ALLC All parameter clear* to initialize all parameters. (Parameters are not cleared when "1" is set in *Pr. 77 Parameter write selection*. Calibration parameters are not cleared with Pr.CL either.)
- Refer to the parameter list on *page 96* and later for parameters to be cleared with this operation.

Operation

1. Screen at power-ON

The monitor display appears.

2. Operation mode change

Press (PU/EXT) to choose the PU operation mode. [PU] indicator is lit.

3. Parameter setting mode

Press (MODE) to choose the parameter setting mode. (The parameter number read previously appears.)

4. Selecting the parameter number

Turn dial until "PrCL parameter clear" ("ALLC all parameter clear") appears. Press (SET) to read the present set value. "0" (initial value) appears.

5. Parameter clear

Turn dial to change it to the set value " 1 ". Press (SET) to set.

" 1 " and "PrCL " flicker alternately after parameters are cleared.

- ·By turning dial, you can read another parameter.
- ·Press (SET) to show the setting again.
- ·Press (SET) twice to show the next parameter.

? " 1 " and "Er4" are displayed alternately ... Why?

☞ The inverter is not in the PU operation mode.

1. Press (PU/EXT).

   PU is lit and the monitor (4 digit LED) displays "0" (*Pr. 79* = "0" (initial value)).
2. Carry out operation from step 5 again.

3.1.9 Parameter copy and parameter verification

PCPY Setting	Description
0	Cancel
1	Copy the source parameters to the operation panel.
2	Write the parameters copied to the operation panel into the destination inverter.
3	Verify parameters in the inverter and operation panel. *(Refer to page 56.)*

REMARKS

- When the copy destination inverter is not the FR-A700 series or parameter copy write is performed after parameter copy read is stopped, "model error (rE4)" is displayed.
- Refer to the parameter list on *page 96* and later for availability of parameter copy.
- When the power is turned OFF or an operation panel is disconnected, etc. during parameter copy write, perform write again or check the values by parameter verification.
- Initial settings of certain parameters are different for different capacities, so some parameter settings may be automatically changed when parameter copy is performed from a different-capacity inverter. After performing a parameter copy from a different-capacity inverter, check the parameter settings. (Refer to the parameter list *(page 96)* for the parameters with different initial settings for different capacities.)

(1) Parameter copy

Parameter settings can be copied to multiple inverters.

Operation

1. Connect the operation panel to the copy source inverter.
●Connect it during a stop.

2. Parameter setting mode
Press (MODE) to choose the parameter setting mode. (The parameter number read previously appears.)

3. Selecting the parameter number
Turn dial until "PCPY" (parameter copy) appears. Press (SET) to read the currently set value. "0" (initial value) appears.

4. Copying to the operation panel
Turn dial to change it to the setting value "1". Press (SET) to copy the source parameters to the operation panel. ("1" flickers for about 30s.)
"1" and "PCPY" flicker alternately after parameters are copied.

5. Connect the operation panel to the copy source inverter.

6. After performing steps 2 and 3, turn dial to change it to "2".

7. Writing to the inverter
Press (SET) to write the parameters copied to the operation panel to the destination inverter. ("2" flickers for about 30s.)
"2" and "PCPY" flicker alternately after parameters are copied.

8. After writing the parameter values to the copy destination inverter, always reset the inverter, e.g. switch power off once, before starting operation.

? rE1 appears...Why? ☞ Parameter read error. Perform operation from step 3 again.
? rE2 appears...Why? ☞ Parameter write error. Perform operation from step 6 again.
? CP and 0.00 flicker alternately
☞ Appears when parameters are copied between the inverter of 55K or lower and 75K or higher.
1. Set "0" (initial value) in *Pr. 160 User group read selection*.
2. Set the following setting (initial value) in *Pr. 989 Parameter copy alarm release*.

	55K or lower	75K or higher
Pr. 989 Setting	10	100

3. Reset *Pr. 9, Pr. 30, Pr. 51, Pr. 52, Pr. 54, Pr. 56, Pr. 57, Pr. 61, Pr. 70, Pr. 72, Pr. 80, Pr. 82, Pr. 90 to Pr. 94 , Pr. 158, Pr. 455, Pr. 458 to Pr. 462, Pr. 557, Pr. 859, Pr. 860, Pr. 893*.

(2) Parameter verification

Whether same parameter values are set in other inverters or not can be checked.

Operation

1.	Move the operation panel to the inverter to be verified. ●Move it during a stop.
2.	Screen at power-ON The monitor display appears.
3.	Parameter setting mode Press (MODE) to choose the parameter setting mode. (The parameter number read previously appears.).
4.	Selecting the parameter number Turn  until "PCPY" (parameter copy) appears. Press (SET) to read the currently set value. "0" (initial value) appears.
5.	Parameter verification Turn  to change it to the setting value "3" (parameter copy verification mode). Press (SET) to read the parameter setting of the verified inverter to the operation panel. ("3" flickers for about 30s.) ●If different parameters exist, different parameter numbers and "rE3" flicker. ●Hold down (SET) to verify.
6.	If there is no difference, "PCPY" and "3" flicker to complete verification.

? rE3 flickers ... Why?

☞ Set frequencies, etc. may be different. Check set frequencies.

3.2 Before operation

3.2.1 Simple mode parameter list

For simple variable-speed operation of the inverter, the initial setting of the parameters may be used as they are. Set the necessary parameters to meet the load and operational specifications. Parameter setting, change and check can be made from the operation panel (FR-DU07). For details of parameters, refer to *Chapter 4 of the Instruction Manual (Applied)*.

POINT

Only simple mode parameter can be displayed using *Pr.160 User group read selection*. (All parameters are displayed with the initial setting.) Set *Pr. 160 User group read selection* as required. (Refer to *page 53* for parameter change.)

Pr. 160	Description
9999	Only the simple mode parameters can be displayed.
0 (Initial Value)	Simple mode and extended mode parameters can be displayed.
1	Only the parameters registered in the user group can be displayed.

Parameter Number	Name	Increments	Initial Value	Range	Applications	Refer to
0	Torque boost	0.1%	6/4/3/2/1%*1	0 to 30%	Set to increase a starting torque or when the motor with a load will not rotate, resulting in an alarm [OL] and a trip [OC1] *1 The initial value differs according to the inverter capacity. (0.4K, 0.75K/1.5K to 3.7K/5.5K, 7.5K/11K to 55K/75K or higher)	59
1	Maximum frequency	0.01Hz	120/60Hz*2	0 to 120Hz	Set when the maximum output frequency need to be limited. *2 The initial value differs according to the inverter capacity. (55K or lower/75K or higher)	59
2	Minimum frequency	0.01Hz	0Hz	0 to 120Hz	Set when the minimum output frequency need to be limited.	
3	Base frequency	0.01Hz	60Hz	0 to 400Hz	Set when the rated motor frequency is 50Hz. Check the motor rating plate.	58
4	Multi-speed setting (high speed)	0.01Hz	60Hz	0 to 400Hz	Set when changing the preset speed in the parameter with a terminal.	88
5	Multi-speed setting (middle speed)	0.01Hz	30Hz	0 to 400Hz		
6	Multi-speed setting (low speed)	0.01Hz	10Hz	0 to 400Hz		
7	Acceleration time	0.1s	5/15s*3	0 to 3600s	Acceleration/deceleration time can be set. *3 The initial value differs according to the inverter capacity. (7.5K or lower/11K or higher)	60
8	Deceleration time	0.1s	5/15s*3	0 to 3600s		
9	Electronic thermal O/L relay	0.01/0.1A*4	Inverter rated current	0 to 500/0 to 3600A*4	Protect the motor from overheat by the inverter. Set the rated motor current. *4 The increments and setting range differ according to the inverter capacity. (55K or lower/75K or higher)	58
79	Operation mode selection	1	0	0, 1, 2, 3, 4, 6, 7	Select the operation command location and frequency command location.	62
125	Terminal 2 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Frequency for the maximum value of the potentiometer (5V initial value) can be changed.	90
126	Terminal 4 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Frequency for the maximum current input (20mA initial value) can be changed.	92
160	User group read selection	1	0	0, 1, 9999	Parameter which can be read from the operation panel and parameter unit can be restricted.	—

3.2.2 Overheat protection of the motor by the inverter (Pr. 9)

Set the rated motor current in *Pr. 9 Electronic thermal O/L relay* to protect the motor from overheat.
Refer to *page 53* for how to change the parameter setting.

Parameter Number	Name	Initial Value	Setting Range *2		Description
9	**Electronic thermal O/L relay**	Inverter rated current *1	55K or lower	0 to 500A	Set the rated motor current.
			75K or higher	0 to 3600A	

*1 *Refer to page 171* for the rated inverter current value. The initial values of the 0.4K and 0.75K are set to 85% of the rated inverter current.
*2 The minimum setting increments are 0.01A for the 55K or lower and 0.1A for the 75K or higher.

REMARKS

- Set *Pr. 9* = "0" for vector-control-dedicated motors (SF-V5RU) because they are already equipped with thermal protectors.

CAUTION

- Protective function by electronic thermal relay function is reset by inverter power reset and reset signal input. Avoid unnecessary reset and power-off.
- When two or more motors are connected to the inverter, they cannot be protected by the electronic thermal relay function. Install an external thermal relay to each motor.
- When the difference between the inverter and motor capacities is large and the setting is small, the protective characteristics of the electronic thermal relay function will be deteriorated. In this case, use an external thermal relay.
- A special motor cannot be protected by the electronic thermal relay function. Use an external thermal relay.
- Electronic thermal relay may not function when 5% or less of inverter rated current is set to electronic thermal relay setting.
- PTC thermistor output built-in the motor can be input to the PTC signal (AU terminal). For details, refer to *Chapter 4 of the Instruction Manual (Applied)*.

3.2.3 When the rated motor frequency is 50Hz (Pr. 3) V/F

First, check the motor rating plate. If a frequency given on the rating plate is "50Hz" only, always set *Pr. 3 Base frequency* to "50Hz". Leaving the base frequency unchanged from "60Hz" may make the voltage low and the torque insufficient. It may result in an inverter trip (E.OC☐) due to overload. Refer to *page 53* for how to change the parameter setting.

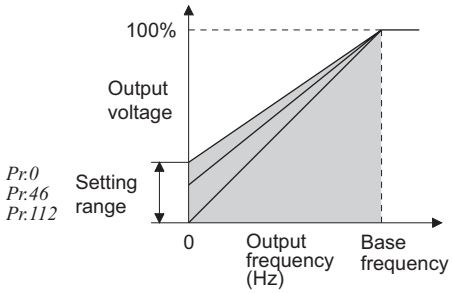
Parameter Number	Name	Initial Value	Setting Range	Description
3	**Base frequency**	60Hz	0 to 400Hz	Set the frequency when the motor rated torque is generated.

REMARKS

- *Pr. 3* is invalid under Advanced magnetic flux vector control, Real sensorless vector control, and vector control and *Pr.84 Rated motor frequency* is valid.

3.2.4 Increasing the starting torque (Pr. 0) V/F

Set this parameter when "the motor with a load will not rotate", "an alarm [OL] is output, resulting in an inverter trip due to [OC1], etc. When the motor with a load will not rotate, increase the *Pr. 0* value 1% by 1% unit by looking at the motor movement. (The guideline is for about 10% change at the greatest.)
Refer to *page 53* for how to change the parameter setting.



Parameter Number	Name	Initial Value		Setting Range	Description
0	Torque boost	0.4K, 0.75K	6%	0 to 30%	Motor torque in the low-frequency range can be adjusted to the load to increase the starting motor torque.
		1.5K to 3.7K	4%		
		5.5K, 7.5K	3%		
		11K to 55K	2%		
		75K or higher	1%		

REMARKS

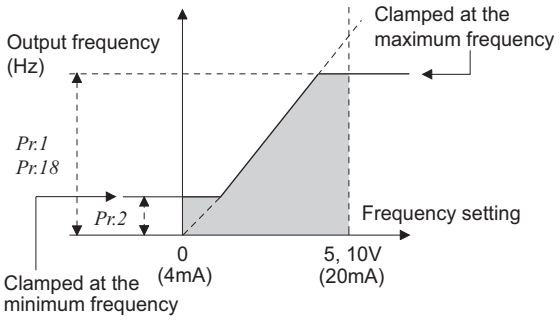
- A too large setting may cause the motor to overheat, resulting in an overcurrent trip (OL (overcurrent alarm) then E.OC1 (overcurrent trip during acceleration)), overload trip (E.THM (motor overload trip), and E.THT (inverter overload trip)).
  (When a fault occurs, release the start command, and decrease the *Pr. 0* setting 1% by 1% to reset. *(Refer to page 53)*

POINT

If the inverter still does not operate properly after the above measures, adjust *Pr. 80*, *Pr. 81* (Advanced magnetic flux vector control), *Pr.800* (Real sensorless vector control). The *Pr.0* setting is invalid under Advanced magnetic flux vector control, Real sensorless vector control and vector control. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*

3.2.5 Limiting the maximum and minimum output frequency (Pr. 1, Pr. 2)

Motor speed can be limited. Refer to *page 53* for how to change the parameter setting.



Parameter Number	Name	Initial Value		Setting Range	Description
1	Maximum frequency	55K or lower	120Hz	0 to 120Hz	Set the upper limit of the output frequency.
		75K or higher	60Hz		
2	Minimum frequency	0Hz		0 to 120Hz	Set the lower limit of the output frequency.

REMARKS

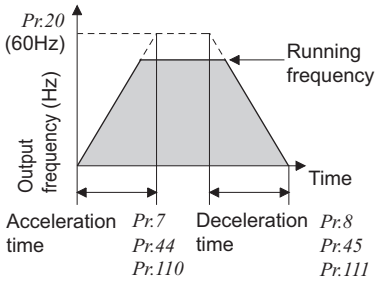
- The output frequency is clamped by the *Pr. 2* setting even if the set frequency is lower than the *Pr. 2* setting (The frequency will not decrease to the *Pr. 2* setting.)
  Note that *Pr. 15 Jog frequency* has higher priority than the minimum frequency.
- When the *Pr. 1* setting is changed, frequency higher than the *Pr. 1* setting can not be set by .
- When performing a high speed operation at 120Hz or more, setting of *Pr. 18 High speed maximum frequency* is necessary.
  (Refer to Chapter 4 of the Instruction Manual (Applied).)

⚠ CAUTION

⚠ If the *Pr. 2* setting is higher than the *Pr. 13 Starting frequency* value, note that the motor will run at the set frequency according to the acceleration time setting by merely switching the start signal on, without entry of the command frequency.

3.2.6 Changing acceleration and deceleration time (Pr. 7, Pr. 8)

Set in *Pr. 7 Acceleration time* a larger value for a slower speed increase and a smaller value for a faster speed increase.
Set in *Pr. 8 Deceleration time* a larger value for a slower speed decrease and a smaller value for a faster speed decrease. Refer to *page 53* for how to change the parameter setting.



Parameter Number	Name	Initial Value		Setting Range	Description
7	Acceleration time	7.5K or lower	5s	0 to 3600/ 360s *	Set the motor acceleration time.
		11K or higher	15s		
8	Deceleration time	7.5K or lower	5s	0 to 3600/ 360s *	Set the motor deceleration time.
		11K or higher	15		

* Depends on the *Pr. 21 Acceleration/deceleration time increments* setting. The initial value for the setting range is "0 to 3600s" and setting increments is "0.1s".

3.2.7 Energy saving operation for fans and pumps (Pr. 14, Pr. 60)

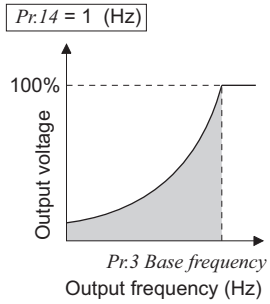
Set the following functions to perform energy saving operation for fans and pumps.

(1) Load pattern selection (*Pr. 14*)

Select the optimum output characteristic (V/F characteristic) that is suitable for the application and load characteristics.

Parameter Number	Name	Initial Value	Setting Range	Description
14	Load pattern selection	0	0	For constant torque load
			1	For variable-torque load
			2	For constant torque elevators (at reverse rotation boost of 0%)
			3	For constant torque elevators (at forward rotation boost of 0%)
			4	RT signal ON: for constant torque load RT signal OFF: for constant torque elevators at reverse rotation boost of 0%
			5	RT signal ON: for constant torque load RT signal OFF: for constant torque elevators at forward rotation boost of 0%

- Set *Pr.14 Load pattern selection* = "1 (for variable-torque load)."
- When the output frequency is equal to or less than the base frequency, the output voltage changes by its square in proportion to the output frequency. Use this setting to drive a load whose load torque changes in proportion to the square of the speed, such as a fan and a pump.



CAUTION

- Load pattern selection is available only under V/F control. Load pattern selection is not available under Advanced magnetic flux vector control, Real sensorless vector control and vector control.

(2) Energy saving control (*Pr. 60*)

Without complicated parameter settings, the inverter could automatically perform energy saving control. This inverter is optimal for fan and pump applications.

Parameter Number	Name	Initial Value	Setting Range	Description
60	Energy saving control selection *	0	0	Normal operation mode
			4	Energy saving operation mode

* When parameter is read using the FR-PU04, a parameter name different from an actual parameter is displayed.

- When "4" is set in *Pr. 60*, the inverter operates in the energy saving operation mode.
- In the energy saving operation mode, the inverter automatically controls the output voltage to minimize the inverter output voltage during a constant operation.

REMARKS

- For applications a large load torque is applied to or machines repeat frequent acceleration/deceleration, an energy saving effect is not expected.

CAUTION

- When the energy saving mode is selected, deceleration time may be longer than the setting value. Since overvoltage alarm tends to occur as compared to the constant torque load characteristics, set a longer deceleration time.
- The energy saving operation mode is available only under V/F control. When the Advanced magnetic flux vector control, Real sensorless vector control and vector control are selected, the energy saving mode is invalid.
- Since output voltage is controlled in energy saving operation mode, output current may slightly increase.

3.2.8 Selection of the start command and frequency command locations (Pr. 79)

Select the start command location and frequency command location.

<table>
<tr><th>Parameter Number</th><th>Name</th><th>Initial Value</th><th>Setting Range</th><th>Description</th><th>LED Indication
: Off
: On</th></tr>
<tr><td rowspan="8">79</td><td rowspan="8">Operation mode selection</td><td rowspan="8">0</td><td>0</td><td>Use External/PU switchover mode (press PU/EXT to switch between the PU and External operation mode. (Refer to page 82))
At power on, the inverter is in the External operation mode.</td><td>PU operation mode
PU EXT NET
External operation mode
PU EXT NET
NET operation mode
PU EXT NET</td></tr>
<tr><td>1</td><td>Fixed to PU operation mode</td><td>PU operation mode
PU EXT NET</td></tr>
<tr><td>2</td><td>Fixed to External operation mode
Operation can be performed by switching between the External and NET operation mode.</td><td>External operation mode
PU EXT NET
NET operation mode
PU EXT NET</td></tr>
<tr><td rowspan="3">3</td><td colspan="2">External/PU combined operation mode 1</td><td rowspan="5">External/PU combined operation mode
PU EXT NET</td></tr>
<tr><td>Running frequency</td><td>Start signal</td></tr>
<tr><td>PU (FR-DU07/FR-PU04/FR-PU07) setting or external signal input (multi-speed setting, across terminals 4 and 5 (valid when AU signal turns on)).*1</td><td>External signal input (terminal STF, STR)</td></tr>
<tr><td rowspan="3">4</td><td colspan="2">External/PU combined operation mode 2</td></tr>
<tr><td>Running frequency</td><td>Start signal</td></tr>
<tr><td>External signal input (Terminal 2, 4, 1, JOG, multi-speed selection, etc.)</td><td>Input from the PU (FR-DU07/FR-PU04/FR-PU07)
(FWD, REV)</td></tr>
<tr><td>6</td><td colspan="2">Switchover mode
Switch among PU operation, External operation, and NET operation while keeping the same operation status.</td><td rowspan="2">PU operation mode
PU EXT NET
External operation mode
PU EXT NET
NET operation mode
PU EXT NET</td></tr>
<tr><td>7</td><td colspan="2">External operation mode (PU operation interlock)
X12 signal ON *2
Operation mode can be switched to the PU operation mode.
(output stop during External operation)
X12 signal OFF *2
Operation mode can not be switched to the PU operation mode.</td></tr>
</table>

*1 The priorities of the frequency commands when *Pr. 79* = "3" are "Multi-speed operation (RL/RM/RH/REX) > PID control (X14) > terminal 4 analog input (AU) > digital input from the operation panel".

*2 For the terminal used for the X12 signal (PU operation interlock signal) input, set "12" in *Pr. 178 to Pr. 189 (input terminal function selection)* to assign functions.

For *Pr. 178 to Pr. 189*, refer to *Chapter 4 of the Instruction Manual (Applied)*.
When the X12 signal is not assigned, function of the MRS signal switches from MRS (output stop) to PU operation interlock signal.

3.2.9 Acquiring large starting torque and low speed torque (Advanced magnetic flux vector control, Real sensorless vector control) (Pr. 71, Pr. 80, Pr. 81, Pr. 800)

Magnetic flux Sensorless

Advanced magnetic flux vector control can be selected by setting the capacity, poles and type of the motor used in *Pr. 80* and *Pr. 81*. Real sensorless vector control can be selected for applications requiring high accuracy and fast response control. Perform offline auto tuning and online auto tuning when using Real sensorless vector control.

- What is Advanced magnetic flux vector control?
  The low speed torque can be improved by providing voltage compensation to flow a motor current which meets the load torque. Output frequency compensation (slip compensation) is made so that the motor actual speed approximates a speed command value. Effective when load fluctuates drastically, etc.
  Low-speed torque is improved as compared to V/F control. In addition, speed accuracy is improved when load is applied.
- What is Real sensorless vector control?
  This function enables vector control with a general-purpose motor without encoder. Low speed torque and speed accuracy are improved as compared to Advanced magnetic flux vector control. Always perform offline auto tuning when using Real sensorless vector control.
  Real sensorless vector control is suitable for the following applications.
  · To minimize the speed fluctuation even at a severe load fluctuation
  · To generate low speed torque
  · To prevent machine from damage due to too large torque (torque limit)
  · To perform torque control

Parameter Number	Name	Initial Value	Setting Range		Description	
71	Applied motor	0	0 to 8, 13 to 18, 20, 23, 24, 30, 33, 34, 40, 43, 44, 50, 53, 54		By selecting a standard motor or constant-torque motor, thermal characteristic and motor constants of each motor are set.	
80	Motor capacity	9999	55K or lower	0.4 to 55kW	Set the applied motor capacity.	
			75K or higher	0 to 3600kW		
			9999		V/F control	
81	Number of motor poles	9999	2, 4, 6, 8, 10		Set the number of motor poles.	
			12, 14, 16, 18, 20		X18 signal-ON:V/F control *	Set 10 + number of motor poles.
			9999		V/F control	
800	Control method selection	20	0 to 5		Vector control *(Refer to page 66)*	
			9		Vector control test operation	
			10		Speed control	Real sensorless vector control
			11		Torque control	
			12		MC signal-ON:torque MC signal-OFF:speed *	
			20		V/F control (Advanced magnetic flux vector control)	

* Use *Pr. 178 to Pr. 189* to assign the terminals used for the X18 and MC signal. *(Refer to Chapter 4 of the Instruction Manual (Applied)).*

POINT

If the following conditions are not satisfied, select V/F control since malfunction such as insufficient torque and uneven rotation may occur.

- The motor capacity should be equal to or one rank lower than the inverter capacity. (note that the capacity is 0.4kW or higher)
- Motor to be used is either Mitsubishi standard motor (SF-JR 0.4kW or higher), high efficiency motor (SF-HR 0.4kW or higher) or Mitsubishi constant-torque motor (SF-JRCA 4P, SF-HRCA 0.4kW to 55kW). When using a motor other than the above (SF-TH other manufacturer's motor), perform offline auto tuning without fail. (Advanced magnetic flux vector control) When performing Real sensorless vector control, offline auto tuning are necessary even when Mitsubishi motor is used.
- Single-motor operation (one motor run by one inverter) should be performed.
- The wiring length from inverter to motor should be within 30m. (Perform offline auto tuning in the state where actual wiring work is performed when the wiring length exceeds 30m.)

CAUTION

- Uneven rotation slightly increases as compared to the V/F control. (It is not suitable for machines such as grinding machine and wrapping machine which requires less uneven rotation at low speed.)
- Changing the terminal assignment using *Pr. 178 to Pr. 189 (input terminal function selection)* may affect the other functions. Set parameters after confirming the function of each terminal.
- When Advanced magnetic flux vector control is performed with a surge voltage suppression filter (FR-ASF-H/FR-BMF-H) connected, output torque may decrease. In addition, do not use a sine wave filter (MT-BSL/BSC).
- Do not perform Real sensorless vector control with a surge voltage suppression filter (FR-ASF-H/FR-BMF-H) or sine wave filer (MT-BSL/BSC) connected.

<Selection method of Advanced magnetic flux vector control>

Perform secure wiring. *(Refer to page 9.)*

↓

Set the motor. *(Pr. 71)*

Motor		*Pr. 71* Setting *1	Remarks
Mitsubishi standard motor Mitsubishi high efficiency motor	SF-JR	0 (initial value)	
	SF-JR 4P-1.5kW or less	20	
	SF-HR	40	
	Others	3	Offline auto tuning is necessary.*2
Mitsubishi constant-torque motor	SF-JRCA 4P	1	
	SF-HRCA	50	
	Others (SF-JRC, etc.)	13	Offline auto tuning is necessary. *2
Other manufacturer's standard motor	–	3	Offline auto tuning is necessary. *2
Other manufacturer's constant-torque motor	–	13	Offline auto tuning is necessary. *2

*1 For other settings of *Pr. 71* , refer to *Chapter 4 of the Instruction Manual (Applied)*.

*2 Refer to *page 71* for offline auto tuning.

↓

Set the motor capacity and the number of motor poles according as required.
(Pr. 80, Pr. 81) (Refer to page 59.)

↓

Set the motor capacity (kW) in *Pr. 80 Motor capacity* and set the number of motor poles (number of poles) in *Pr. 81 Number of motor poles*. (V/F control is performed when the setting is "9999" (initial value).

Set the run command. *(Refer to page 82.)*

↓

Select the start command and speed command.
(1) Start command

1) Operation panel: Setting by pressing FWD / REV of the operation panel
2) External command: Setting by forward rotation or reverse rotation command (terminal STF or STR)

(2)Speed command

1) Operation panel: Setting by turning of the operation panel
2) External analog command (terminal 2 or 4) :
Give a speed command using the analog signal input to terminal 2 (or terminal 4).
3) Multi-speed command:
The external signals (RH, RM, RL) may also be used to give speed command.

↓

Test run

As required

- Perform offline auto tuning. *(Pr.96) (refer to page 71).*
- Select online auto tuning. *(Pr.95) (refer to page 75).*

REMARKS

- When higher accuracy operation is necessary, set online auto tuning after performing offline auto tuning and select Real sensorless vector control.
- Use *Pr. 89* to adjust the motor speed fluctuation at load fluctuation. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*

<Selection method of Real sensorless vector control (speed control) >

Speed control is exercised to match the speed command and actual motor speed.

Perform secure wiring. *(Refer to page 9.)*

↓

Set the motor. *(Pr. 71) (Refer to page 63.)*

↓ Set "3" (standard motor) or "13" (constant-torque motor) in *Pr. 71 Applied motor*.

Set the motor capacity and the number of motor poles. *(Pr. 80, Pr. 81) (Refer to page 63.)*

↓ Set the motor capacity (kW) in *Pr. 80 Motor capacity* and set the number of motor poles (number of poles) in *Pr. 81 Number of motor poles*. (V/F control is performed when the setting is "9999" (initial value).)

Select a control method. *(Refer to page 63)*

↓ Set "10" (speed control) or "12" (speed-torque switchover) in *Pr. 800* and make speed control valid.

Set the operation command. *(Refer to page 82)*

↓ Select the start command and speed command.

(3) Start command

1) Operation panel: Setting by pressing FWD / REV of the operation panel

2) External command: Setting by forward rotation and reverse rotation command (terminal STF or STR)

(4) Speed command

1) Operation panel: Setting by turning of the operation panel

2) External analog command (terminal 2 or 4) :
Give a speed command using the analog signal input to terminal 2 (or terminal 4).

3) Multi-speed command:
The external signals (RH, RM, RL) may also be used to give speed command.

Set the torque limit. *(Pr. 810) (Refer to Chapter 4 of the Instruction Manual (Applied).)*

↓

Perform offline auto tuning. *(Pr. 96) (Refer to page 71.)*

↓

Test run

As required

- Select online auto tuning. *(Pr. 95) (Refer to page 75)*
- Easy gain tuning *(Refer to page 76)*
- Manual input speed control gain adjustment *(Refer to page 78)*

CAUTION

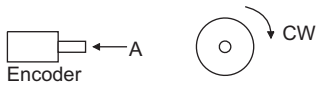
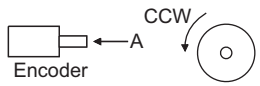
- Make sure to perform offline auto tuning before performing Real sensorless vector control.
- Speed command setting range is 0 to 120Hz for Real sensorless vector control.
- The carrier frequencies are selectable from among 2k, 6k, 10k, 14kHz for Real sensorless vector control.
- Torque control can not be performed in the low speed (approx. 10Hz or less) regeneration range and with light load at low speed (approx. 20% or less of rated torque at approx. 5Hz or less). Choose vector control.
- Performing pre-excitation (LX signal and X13 signal) under torque control may start the motor running at a low speed even when the start command (STF or STR) is not input. The motor may run also at a low speed when the speed limit value = 0 with a start command input. Perform pre-excitation after making sure that there will be no problem in safety if the motor runs.
- Do not switch between the STF (forward rotation command) and STR (reverse rotation command) during operation under torque control. Overcurrent trip (E.OC☐) or opposite rotation deceleration fault (E.11) occurs.
- For the 0.4K to 3.7K, the speed deviation may become large at 20Hz or less and torque may become insufficient in the low speed range under 1Hz during continuous operation under Real sensorless vector control. In this case, stop the inverter once, then start again to improve.
- When the inverter is likely to start during motor coasting under Real sensorless vector control, set to make frequency search of automatic restart after instantaneous power failure valid (*Pr. 57* ≠ "9999", *Pr. 162* = "10").
- Enough torque may not be generated in the ultra-low speed range less than approx. 2Hz when performing Real sensorless vector control.
  The guideline of speed control range is as shown below.

Driving:	1:200	(2, 4, 6 poles)	Can be used at 0.3Hz or more at rated 60Hz
	1:30	(8, 10 poles)	Can be used at 2Hz or more at rated 60Hz
Regeneration:	1:12	(2 to 10 poles)	Can be used at 5Hz or more at rated 60Hz

3.2.10 Higher accuracy operation using a motor with encoder (Vector control) (Pr.71, Pr.80, Pr.81, Pr.359, Pr.369, Pr.800) Vector

Full-scale vector control can be performed fitting the FR-A7AP/FR-A7AL and using a motor with encoder. Fast response/high accuracy speed control (zero speed control, servo lock), torque control, and position control can be performed.

- What is vector control?
  Excellent control characteristics when compared to V/F control and other control techniques, achieving the control characteristics equal to those of DC machines.
  It is suitable for applications below.
  · To minimize the speed fluctuation even at a severe load fluctuation
  · To generate low speed torque
  · To prevent machine from damage due to too large torque (torque limit)
  · To perform torque control or position control
  · Servo-lock torque control which generates a torque at zero speed (i.e. status of motor shaft = stopped)

Parameter Number	Name	Initial Value	Setting Range	Description
71	Applied motor	0	0 to 8, 13 to 18, 20, 23, 24, 30, 33, 34, 40, 43, 44, 50, 53, 54	By selecting a standard motor or constant-torque motor, thermal characteristic and motor constants of each motor are set.
80	Motor capacity	9999	55K or lower: 0.4 to 55kW 75K or higher: 0 to 3600kW	Set the applied motor capacity.
			9999	V/F control
81	Number of motor poles	9999	2, 4, 6, 8, 10	Set the number of motor poles.
			12, 14, 16, 18, 20	X18 signal-ON:V/F control * / Set 10 + number of motor poles.
			9999	V/F control
359	Encoder rotation direction	1	0	 Clockwise direction as viewed from A is forward rotation
			1	 Counter clockwise direction as viewed from A is forward rotation
369	Number of encoder pulses	1024	0 to 4096	Set the number of pulses of the encoder. Set the number of pulses before multiplied by four.
800	Control method selection	20	0	Speed control / Vector control
			1	Torque control / Vector control
			2	MC signal-ON:torque MC signal-OFF:speed * / Vector control
			3	Position control / Vector control
			4	MC signal-ON:position MC signal-OFF:speed * / Vector control
			5	MC signal-ON:torque MC signal-OFF:position * / Vector control
			9	Vector control test operation *(Refer to Chapter 4 of the Instruction Manual (Applied))*
			10 to 12	Real sensorless vector control *(Refer to page 65)*
			20	V/F control (Advanced magnetic flux vector control)

* Use *Pr. 178 to Pr. 189* to assign the terminals used for the X18 and MC signal. *(Refer to Chapter 4 of the Instruction Manual (Applied)).*

POINT

If the conditions below are not satisfied, malfunction such as insufficient torque and uneven rotation may occur.

- The motor capacity should be equal to or one rank lower than the inverter capacity. (note that the capacity is 0.4kW or higher)
- Motor to be used is either Mitsubishi standard motor with encoder (SF-JR 0.4kW or higher), high efficiency motor with encoder (SF-HR 0.4kW or higher) or Mitsubishi constant-torque motor with encoder (SF-JRCA 4P, SF-HRCA 0.4kW to 55kW) or vector with encoder control dedicated motor (SF-V5RU (1500r/min series)). When using a motor other than the above (other manufacturer's motor), perform offline auto tuning without fail.
- Single-motor operation (one motor run by one inverter) should be performed.
- Wiring length from inverter to motor should be within 30m. (Perform offline auto tuning in the state where wiring work is performed when the wiring length exceeds 30m.)

CAUTION

- Changing the terminal assignment using *Pr. 178 to Pr. 189 (input terminal function selection)* may affect the other functions. Set parameters after confirming the function of each terminal.
- Do not perform vector control with a surge voltage suppression filter (FR-ASF-H/FR-BMF-H) or sine wave filer (MT-BSL/BSC) connected.

<Selection method of speed control>

Speed control is exercised to match the speed command and actual motor speed.

Perform secure wiring. *(Refer to page 31.)*

↓ Mount the FR-A7AP/FR-A7AL (option).

Set the motor and encoder. *(Pr. 71, Pr. 359, Pr. 369)*

↓ Set *Pr. 71 Applied motor*, *Pr. 359 Encoder rotation direction* and *Pr. 369 Number of encoder pulses* according to the motor and encoder used. *(Refer to page 33.)*

Set the motor capacity and the number of motor poles
(Pr. 80, Pr. 81) (Refer to page 66.)

↓ Set the motor capacity (kW) in *Pr. 80 Motor capacity* and set the number of motor poles (number of poles) in *Pr. 81 Number of motor poles*. (V/F control is performed when the setting is "9999" (initial value).)

Select a control method. *(Refer to page 66.)*

↓ Make speed control valid by selecting "0" (speed control), "2" (speed-torque switchover), or "4" (speed-position switchover) for *Pr. 800*.

Set the run command. *(Refer to page 83.)*

↓ Select the start command and speed command.

(1) Start command

1)Operation panel: Setting by pressing FWD/REV of the operation panel

2)External command: Setting by forward rotation or reverse rotation command (terminal STF or STR)

(2)Speed command

1)Operation panel: Setting by turning of the operation panel

2)External analog command (terminal 2 or 4) :
Give a speed command using the analog signal input to terminal 2 (or terminal 4).

3)Multi-speed command:
The external signals (RH, RM, RL) may also be used to give speed command.

Set the torque limit. *(Pr. 810)*
(Refer to Chapter 4 of the Instruction Manual (Applied).)

↓

Test run

As required

- Perform offline auto tuning. *(Pr. 96) (refer to page 71)*.
- Select online auto tuning. *(Pr. 95) (refer to page 75)*.
- Easy gain tuning *(refer to page 76)*
- Manual input speed control gain adjustment *(refer to page 78)*

CAUTION

- Speed command setting range is 0 to 120Hz for vector control.
- The carrier frequencies are selectable from among 2k, 6k, 10k, 14kHz for vector control. (2k and 6kHz for the 75K or higher)

<Selection method of torque control>

- Torque control is exercised to develop torque as set in the torque command.
- The motor speed becomes constant when the motor output torque and load torque are balanced. For torque control, therefore, the speed is determined by the load.
- For torque control, the motor gains speed as the motor output torque becomes greater than the motor load. To prevent overspeed, set the speed limit value so that the motor speed does not increase too high. (Speed control is exercised during speed limit and torque control is disabled.)
- When speed limit is not set, the speed limit value setting is regarded as 0Hz to disable torque control.

Perform secure wiring. *(Refer to page 31.)*

↓ Mount the FR-A7AP/FR-A7AL (option).

Set the motor and encoder. *(Pr. 71, Pr. 359, Pr. 369)*

↓ Set *Pr. 71 Applied motor*, *Pr. 359 Encoder rotation direction* and *Pr. 369 Number of encoder pulses* according to the motor and encoder used. *(Refer to page 33.)*

Set the motor capacity and the number of motor poles. *(Pr. 80, Pr. 81)*
(Refer to page 66.)

↓ Set the motor capacity (kW) in *Pr. 80 Motor capacity* and set the number of motor poles in *Pr. 81 Number of motor poles*.
(V/F control is performed when the setting is "9999" (initial value).)

Select a control method. *(Refer to page 66.)*

↓ Set either "1" (torque control), "2" (speed-torque switchover) or "5" (position-torque switchover) in *Pr. 800* and make torque control valid.

Set the torque command. *(Pr. 804)*
(Refer to Chapter 4 of the Instruction Manual (Applied).)

↓

Set the speed limit. *(Pr. 807)*
(Refer to Chapter 4 of the Instruction Manual (Applied).)

↓

Test run

As required

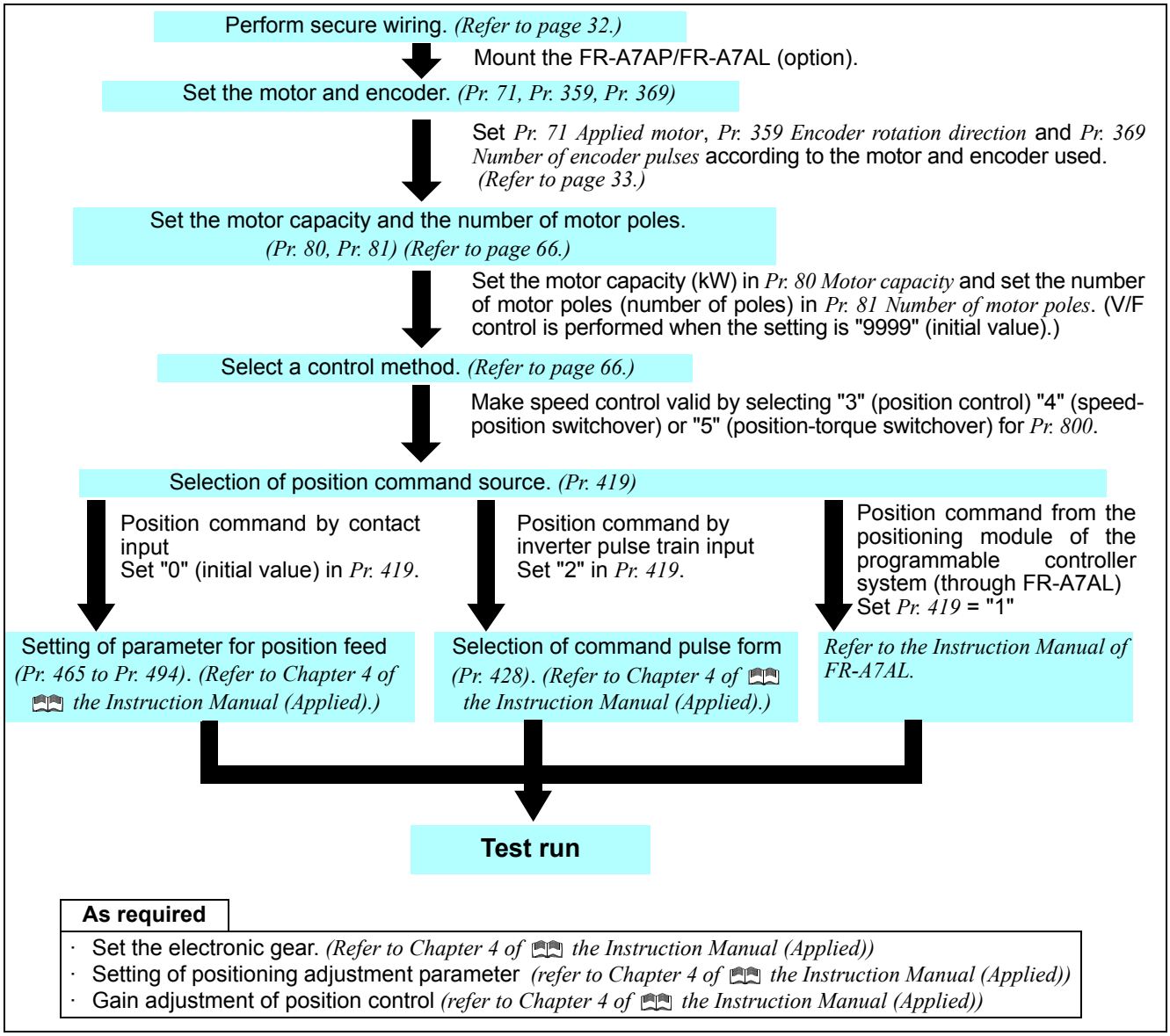
- Perform offline auto tuning. *(Pr. 96) (refer to page 71).*
- Select online auto tuning. *(Pr. 95) (refer to page 75).*
- Manual input torque control gain adjustment *(refer to Chapter 4 of the Instruction Manual (Applied))*

CAUTION

- The carrier frequencies are selectable from among 2k, 6k, 10k, 14kHz for vector control. (2k and 6kHz for the 75K or higher)

<Selection method of position control>

- In the position control, the speed command is calculated so that the difference between command pulse (or parameter setting) and the number of feedback pulses from the encoder is zero in order to run the motor.
- This inverter can perform simple position feed by contact input, position control by inverter simple pulse input, and position control by FR-A7AL pulse train input.



CAUTION

· The carrier frequencies are selectable from among 2k, 6k, 10k, 14kHz for vector control. (2k and 6kHz for the 75K or higher)

3.2.11 Exhibiting the best performance of the motor performance (offline auto tuning) (Pr. 71, Pr. 83, Pr. 84, Pr. 96) Magnetic flux Sensorless Vector

The motor performance can be maximized with offline auto tuning.

- What is offline auto tuning?
  When performing Advanced magnetic flux vector control, Real sensorless vector control or vector control, the motor can be run with the optimum operating characteristics by automatically measuring the motor constants (offline auto tuning) even when each motor constants differs, other manufacturer's motor is used, or the wiring length is long.

Parameter Number	Name	Initial Value	Setting Range	Description
71	Applied motor	0	0 to 8, 13 to 18, 20, 23, 24, 30, 33, 34, 40, 43, 44, 50, 53, 54	By selecting a standard motor or constant torque motor, thermal characteristic and motor constants of each motor are set.
83	Rated motor voltage	200/ 400V*	0 to 1000V	Set the rated motor voltage(V). * The initial value differs according to the voltage level. (200V/400V)
84	Rated motor frequency	60Hz	10 to 120Hz	Set the rated motor frequency (Hz).
96	Auto tuning setting/ status	0	0	Offline auto tuning is not performed
			1	Offline auto tuning is performed without motor running
			101	Offline auto tuning is performed with motor running

POINT

- This function is valid only when a value other than "9999" is set in *Pr. 80* and *Pr. 81* and Advanced magnetic flux vector control, Real sensorless vector control or vector control is selected.
- You can copy the offline auto tuning data (motor constants) to another inverter with the PU (FR-DU07/FR-PU07).
- Even when motors (other manufacturer's motor, SF-JRC, SF-TH, etc.) other than Mitsubishi standard motor (SF-JR 0.4kW or higher), high efficiency motor (SF-HR 0.4kW or higher), Mitsubishi constant-torque motor (SF-JRCA 4P, SF-HRCA 0.4kW to 55kW) and vector control dedicated motor (SF-V5RU (1500r/min series)) are used or the wiring length is long (30m or more as a reference), using the offline auto tuning function runs the motor with the optimum operating characteristics.
- Tuning is enabled even when a load is connected to the motor. (As the load is lighter, tuning accuracy is higher. Tuning accuracy does not change even if the inertia is large.)
- For the offline auto tuning, you can select either the motor non-rotation mode (*Pr. 96* = "1") or rotation mode (*Pr. 96* = "101").
- The rotation mode has higher tuning accuracy than the non-rotation mode.
- Reading/writing/copy of motor constants tuned by offline auto tuning are enabled.
- The offline auto tuning status can be monitored with the PU (FR-DU07/FR-PU07/FR-PU04).
- Do not connect a surge voltage suppression filter (FR-ASF-H/FR-BMF-H) to the 55K or lower and sine wave filter (MT-BSL/BSC) to the 75K or higher between the inverter and motor.

(1) Before performing offline auto tuning

Check the following before performing offline auto tuning.

- Make sure Advanced magnetic flux vector control *(Pr. 80, Pr. 81)*, Real sensorless vector control or vector control *(Pr. 800)* is selected.
- A motor should be connected. Note that the motor should be at a stop at a tuning start.
- The motor capacity should be equal to or one rank lower than the inverter capacity. (note that the capacity is 0.4kW or higher)
- Motors such as high-slip motor, high-speed motor and special motor cannot be tuned. (The maximum frequency is 120Hz.)
- Even if tuning is performed without motor running (*Pr. 96 Auto tuning setting/status* = "1"), the motor may run slightly. Therefore, fix the motor securely with a mechanical brake, or before tuning, make sure that there will be no problem in safety if the motor runs. (Caution is required especially in vertical lift applications). Note that if the motor runs slightly, tuning performance is unaffected.
- Note the following when selecting offline auto tuning performed with motor running (*Pr. 96 Auto tuning setting/status* = "101").
  Torque is not enough during tuning.
  The motor may be run at nearly its rated speed.
  The mechanical brake is open.
  No external force is applied to rotate the motor.
- Offline auto tuning will not be performed properly if it is performed with a surge voltage suppression filter (FR-ASF-H/FR-BMF-H) connected to the 55K or lower and sine wave filter (MT-BSL/BSC) connected to the 75K or higher between the inverter and motor. Remove it before starting tuning.
- When exercising vector control, use the encoder that is coupled directly to the motor shaft without looseness. Speed ratio should be 1:1.

(2) Setting

1) Select the Advanced magnetic flux vector control, Real sensorless vector control or vector control.
2) Set "1" or "101" in *Pr. 96 Auto tuning setting/status* .
   · When the setting is "1" . . . . . Tuning is performed without motor running.
   It takes approximately 25 to 120s * until tuning is completed.
   (Excitation noise is produced during tuning.)
   *Tuning time differs according to the inverter capacity and motor type.
   · When the setting is "101" . . . . . Tuning is performed with motor running.
   It takes approximately 40s until tuning is completed.
   The motor runs at nearly its rated frequency.
3) Set the rated motor current (initial value is rated inverter current) in *Pr. 9 Electronic thermal O/L relay*.
4) Set the rated voltage of motor (initial value is 200V/400V) in *Pr. 83 Rated motor voltage* and rated frequency of motor (initial value is 60Hz) in *Pr. 84 Rated motor frequency* .
   (For a Japanese standard motor, etc. which has both 50Hz and 60Hz rated values, set 200V/60Hz or 400V/60Hz).)
   For vector control dedicated motor SF-V5RU1 / V5RU3 / V5RU4, set as the following table.

	***Pr. 83* Setting**	***Pr. 84* Setting**
SF-V5RU1-30kW or less	160V	33.33Hz
SF-V5RU1-37kW	170V	
SF-V5RU3-22kW or less	160V	
SF-V5RU3-30kW	170V	
SF-V5RU4-3.7kW, 7.5kW	150V	16.67Hz
SF-V5RU4-other than the above	160V	

REMARKS

- When using the vector control dedicated motor SF-V5RU (1500r/min series) and SF-THY, setting 33 and 34 in *Pr. 71* selects internal constants appropriate for dedicated motors. Therefore, *Pr. 83* and *Pr. 84* settings are unnecessary.
- Perform auto tuning for SF-V5RU (except for 1500 r/min series) with setting 13 or 14 in *Pr. 71* (For perform auto tuning, set *Pr. 83* and *Pr. 84*)
- When *Pr. 11 DC injection brake operation time* = "0" or *Pr.12 DC injection brake operation voltage* = "0," offline auto tuning is performed at the initial setting of *Pr. 11* or *Pr. 12*.
- When the positioning control is selected (*Pr. 800* = "3" or "5" (when MC signal is OFF)), offline auto tuning is not performed.

5) Set *Pr. 71 Applied motor* according to the motor used.

Motor		***Pr. 71* Setting** *
Mitsubishi standard motor Mitsubishi high efficiency motor	SF-JR, SF-TH	3
	SF-JR 4P-1.5kW or less	23
	SF-HR	43
	Others	3
Mitsubishi constant-torque motor	SF-JRCA 4P, SF-TH (constant-torque)	13
	SF-HRCA	53
	Others (SF-JRC, etc.)	13
Vector control dedicated motor	SF-V5RU (1500r/min series) SF-THY	33
	SF-V5RU (except for 1500r/min series)	13
Other manufacturer's standard motor	–	3
Other manufacturer's constant-torque motor	–	13

* For other settings of *Pr. 71* , refer to *Chapter 4 of the Instruction Manual (Applied)*.

(3) Execution of tuning

CAUTION

· Before performing tuning, check the monitor display of the operation panel (FR-DU07) or parameter unit (FR-PU04/FR-PU07) if the inverter is in the state ready for tuning. (Refer to 2) below) When the start command is turned ON under V/F control, the motor starts.

1)When performing PU operation, press (FWD) / (REV) of the operation panel.

For External operation, turn ON the start command (STF signal or STR signal). Tuning starts.

REMARKS

· Satisfy the required inverter start conditions to start offline auto tuning. For example, stop the input of MRS signal.

· To force tuning to end, use the MRS or RES signal or press (STOP RESET) of the operation panel.
(Turning the start signal (STF signal or STR signal) OFF also ends tuning.)

· During offline auto tuning, only the following I/O signals are valid: (initial value)
· Input signals <valid signal> STOP, OH, MRS, RT, CS, RES, STF, STR
· Output terminal RUN, OL, IPF, FM, AM, A1B1C1
Note that the progress status of offline auto tuning is output in fifteen steps from AM and FM when speed and output frequency are selected.

· Do not perform ON/OFF switching of the second function selection signal (RT) during execution of offline auto tuning. Auto tuning is not executed properly.

· Setting offline auto tuning (*Pr. 96 Auto tuning setting/status* = "1 or 101") will make pre-excitation invalid.

CAUTION

· When selecting offline auto tuning performed with motor running (*Pr. 96 Auto tuning setting/status* = "101"), caution must be taken since the motor runs.

· Since the RUN signal turns ON when tuning is started, caution is required especially when a sequence which releases a mechanical brake by the RUN signal has been designed.

· When executing offline auto tuning, input the run command after switching ON the main circuit power (R/L1, S/L2, T/L3) of the inverter.

· While *Pr. 79* = "7," turn the X12 signal ON to tune in the PU operation mode.

2)Monitor is displayed on the operation panel (FR-DU07) and parameter unit (FR-PU07/FR-PU04) during tuning as below.

	Parameter Unit (FR-PU07/FR-PU04) Display		Operation Panel (FR-DU07) Display	
Pr. 96 setting	1	101	1	101
(1) Setting	1 --- STOP PU	101 --- STOP PU		
(2) Tuning in progress	TUNE 2 STF FWD PU	TUNE 102 STF FWD PU		
(3) Normal end	TUNE 3 COMPLETION STF STOP PU	TUNE 103 COMPLETION STF STOP PU	 Flickering	 Flickering
(4) Error end (when the inverter protective function is activated)	TUNE 9 ERROR STF STOP PU			

· Reference: Offline auto tuning time (when the initial value is set)

Offline Auto Tuning Setting	Time
Non-rotation mode (*Pr. 96* = "1")	Approximately 25 to 120s (Tuning time differs according to the inverter capacity and motor type.)
Rotation mode (*Pr. 96* = "101")	Approximately 40s (Offline auto tuning time varies with the acceleration and deceleration time settings as indicated below. Offline auto tuning time = acceleration time + deceleration time + approx. 30s)

3)When offline auto tuning ends, press STOP RESET of the operation panel during PU operation. For External operation, turn OFF the start signal (STF signal or STR signal).
This operation resets the offline auto tuning and the PU's monitor display returns to the normal indication.
(Without this operation, next operation cannot be started.)

REMARKS

- Do not change the *Pr. 96* setting after completion of tuning (3 or 103).
  If the *Pr. 96* setting is changed, tuning data is invalid.
  If the *Pr. 96* setting is changed, tuning must be performed again.

4)If offline auto tuning ended in error (see the table below), motor constants are not set.
Perform an inverter reset and restart tuning.

Error Display	Error Cause	Remedy
8	Forced end	Set "1" or "101" in *Pr. 96* and perform tuning again.
9	Inverter protective function operation	Make setting again.
91	Current limit (stall prevention) function was activated.	Increase acceleration/deceleration time. Set "1" in *Pr. 156* .
92	Converter output voltage reached 75% of rated value.	Check for fluctuation of power supply voltage.
93	Calculation error A motor is not connected.	Check the motor wiring and make setting again.

5)When tuning is ended forcibly by pressing STOP RESET or turning OFF the start signal (STF or STR) during tuning, offline auto tuning does not end properly. (The motor constants have not been set.)
Perform an inverter reset and restart tuning.

6)When using the motor corresponding to the following specifications and conditions, reset *Pr. 9 Electronic thermal O/L relay* as below after tuning is completed.

a) When the rated power specifications of the motor is 200/220V (400/440V) 60Hz, set 1.1 times rated motor current value in *Pr.9*.

b) When performing motor protection from overheat using a PTC thermistor or motor with temperature detector such as Klixon, set "0" (motor overheat protection by the inverter is invalid) in *Pr. 9*.

CAUTION

- The motor constants measured once in the offline auto tuning are stored as parameters and their data are held until the offline auto tuning is performed again.
- An instantaneous power failure occurring during tuning will result in a tuning error.
  After power is restored, the inverter goes into the normal operation mode. Therefore, when STF (STR) signal is ON, the motor runs in the forward (reverse) rotation.
- Any alarm occurring during tuning is handled as in the ordinary mode. Note that if a fault retry has been set, retry is ignored.
- The set frequency monitor displayed during the offline auto tuning is 0Hz.

⚠ CAUTION

⚠ Note that the motor may start running suddenly.

⚠ When the offline auto tuning is used in vertical lift application, e.g. a lifter, it may drop due to insufficient torque.

3.2.12 High accuracy operation unaffected by the motor temperature (online auto tuning) (Pr. 95) Magnetic flux Sensorless Vector

When online auto tuning is selected under Advanced magnetic flux vector control, Real sensorless vector control or vector control, excellent torque accuracy is provided by temperature compensation even if the secondary resistance value of the motor varies with the rise of the motor temperature.

Parameter Number	Name	Initial Value	Setting Range	Description
95	Online auto tuning selection	0	0	Online auto tuning is not performed
			1	Start-time online auto tuning
			2	Magnetic flux observer (normal tuning)

(1) Start-time online auto tuning (setting is "1")

- By quickly tuning the motor constants at a start, high accuracy operation unaffected by the motor temperature and stable operation with high torque down to ultra low speed can be performed.
- Make sure Advanced magnetic flux vector control (*Pr. 80, Pr. 81*), Real sensorless vector control or vector control (*Pr. 800*) is selected. (*Refer to page 63*.)
- Before performing online auto tuning, perform offline auto tuning without fail.

<Operation method>

1) Check that "3" or "103" (offline auto tuning completion) is set in *Pr. 96Auto tuning setting/status*.
2) Set "1" (start-time online auto tuning) in *Pr. 95 Online auto tuning selection*.
   Online auto tuning is performed from the next starting.
3) When performing PU operation, press FWD/REV of the operation panel.
   For External operation, turn ON the run command (STF signal or STR signal).

CAUTION

- For using start-time online auto tuning in elevator, examine the utilization of a brake sequence for the brake opening timing at a start. Though the tuning ends in about a maximum of 500ms after a start, torque is not provided fully during that period. Therefore, note that there may be a possibility of drop due to gravity. It is recommended to perform tuning using a start time tuning signal (X28). *(Refer to Chapter 4 of the Instruction Manual (Applied).)*

(2) Magnetic flux observer (normal tuning) (setting value is "2")

- When exercising vector control using a motor with encoder, it is effective for torque accuracy improvement.
  The current flowing in the motor and the inverter output voltage are used to estimate/observe the magnetic flux in the motor.
  The magnetic flux of the motor is always (including during operation) detected with high accuracy so that an excellent characteristic is provided regardless of the change in the temperature of the secondary resistance.
- Vector control *(Pr. 80, Pr. 81, Pr. 800)* should be selected. *(Refer to page 91.)*

CAUTION

- For the SF-V5RU, SF-JR (with encoder), SF-HR (with encoder), SF-JRCA (with encoder) or SF-HRCA (with encoder), it is not necessary to perform offline auto tuning to select adaptive magnetic flux observer. (Note that it is necessary to perform offline auto tuning for the wiring length resistance to be reflected on the control when the wiring length is long (30m or longer as reference).

REMARKS

- Online auto tuning does not operate if the MRS signal is input, if the preset speed is less than the *Pr. 13 Starting frequency* (V/F control or Advanced magnetic flux vector control), or if the starting conditions of the inverter are not satisfied, e.g. inverter error.
- Online auto tuning does not operate during deceleration or at a restart during DC brake operation.
- Invalid for jog operation.
- Automatic restart after instantaneous power failure overrides when automatic restart after instantaneous power failure is selected. (Start-time online auto tuning is not performed at frequency search.)
  Perform online auto tuning at a stop with the X28 signal when using automatic restart after instantaneous power failure together.
  (Refer to *Chapter 4 of the Instruction Manual (Applied)* for details.)
- Zero current detection and output current detection are valid during online auto tuning.
- The RUN signal is not output during online auto tuning. The RUN signal turns ON at a start.
- If the period from an inverter stop to a restart is within 4s, start-time tuning is performed but the tuning results are not reflected.

3.2.13 To perform high accuracy/fast response operation (gain adjustment of Real sensorless vector control and vector control) (Pr. 818 to Pr. 821, Pr. 880)

Sensorless Vector

The ratio of the load inertia to the motor inertia (load inertia moment) is estimated in real time from the torque command and speed during motor operation by vector control. As optimum gain of speed control and position control are automatically set from the load inertia ratio and response level, time and effort of making gain adjustment are reduced. (Easy gain tuning)
When the load inertia ratio can not be estimated due to load fluctuation or Real sensorless vector control is exercised, control gain is automatically set by manually inputting the load inertia ratio.
Make a manual input adjustment when vibration, noise or any other unfavorable phenomenon occurs due to large load inertia or gear backlash, for example, or when you want to exhibit the best performance that matches the machine.

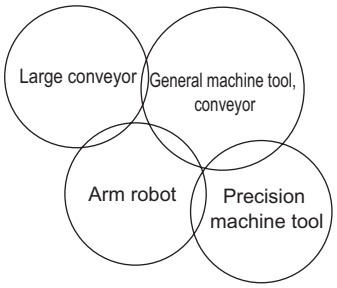
Parameter Number	Name	Initial Value	Setting Range	Description
818	**Easy gain tuning response level setting**	2	1 to 15	Set the response level. 1: Slow response to 15: Fast response
819	**Easy gain tuning selection**	0	0	Without easy gain tuning
			1	With load estimation, with gain calculation (valid only during vector control)
			2	With load *(Pr. 880)* manual input, gain calculation
820	**Speed control P gain 1**	60%	0 to 1000%	Set the proportional gain for speed control. (Increasing the value improves trackability in response to a speed command change and reduces speed variation with disturbance.)
821	**Speed control integral time 1**	0.333s	0 to 20s	Set the integral time during speed control. (Decrease the value to shorten the time taken for returning to the original speed if speed variation with disturbance occurs.)
880	**Load inertia ratio**	7 times	0 to 200 times	Set the load inertia ratio to the motor.

(1) Easy gain tuning execution procedure (*Pr. 819* = "1" load inertia ratio automatic estimation)

Easy gain tuning (load inertia ratio automatic estimation) is valid only in the speed control or position control mode under vector control.
It is invalid under torque control, V/F control, Advanced magnetic flux vector control and Real sensorless vector control.

1) Set the response level using *Pr. 818 Easy gain tuning response level setting*.
Refer to the diagram on the right and set the response level.
Increasing the value will improve trackability to the command, but too high value will generate vibration. The relationship between the setting and response level are shown on the right.

Pr. 818 setting	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Response level	Slow response ←								→ Middle response ←					→ Fast response	
Guideline of mechanical resonance frequency (Hz)	8	10	12	15	18	22	28	34	42	52	64	79	98	122	150



2) Each control gain is automatically set from the load inertia ratio estimated during acceleration/deceleration operation and the *Pr. 818 Easy gain tuning response level setting* value.
Pr. 880 Load inertia ratio is used as the initial value of the load inertia ratio for tuning. Estimated value is set in *Pr. 880* during tuning.
The load inertia ratio may not be estimated well, e.g. it takes a long time for estimation, if the following conditions are not satisfied.
- Time taken for acceleration/deceleration to reach 1500r/min is 5s or less.
- Speed is 150r/min or more.
- Acceleration/deceleration torque is 10% or more of the rated torque.
- Abrupt disturbance is not applied during acceleration/deceleration.
- Load inertia ratio is approx. 30 times or less.
- No gear backlash nor belt looseness is found.

3) Press (FWD) or (REV) to estimate the load inertia ratio or calculate gain any time. (The operation command for External operation is the STF or STR signal.)

(2) Easy gain tuning execution procedure (*Pr.819* = "2" load inertia manual input)

Easy gain tuning (load inertia ratio manual input) is valid only in the speed control mode under Real sensorless vector control or in the speed control or position control mode under vector control.

1) Set the load inertia ratio to the motor in *Pr. 880 Load inertia ratio*.
2) Set "2" (with easy gain tuning) in *Pr. 819 Easy gain tuning selection*. Then, *Pr. 820 Speed control P gain 1* and *Pr. 821 Speed control integral time 1* are automatically set by gain calculation.
Operation is performed in a gain adjusted status from the next operation.
3) Perform a test run and set the response level in *Pr. 818 Easy gain tuning response level setting*. Increasing the value will improve trackability to the command, but too high value will generate vibration. (When "2" (parameter write enabled during operation) is set in *Pr. 77 Parameter write selection* , response level adjustment can be made during operation.)

REMARKS

- When "1 or 2" is set in *Pr. 819* and then returned the *Pr. 819* setting to "0" after tuning is executed, tuning results which are set in each parameter remain unchanged.
- When good tuning accuracy is not obtained after executing easy gain tuning due to disturbance and such, perform fine adjustment by manual input. Set "0" (without easy gain tuning) in *Pr. 819*.

(3) Parameters automatically set by easy gain tuning

The following table indicates the relationship between easy gain tuning function and gain adjustment parameter.

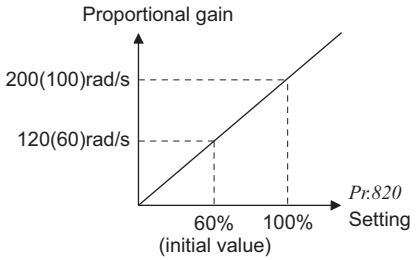
	Easy Gain Tuning Selection *(Pr. 819)* Setting		
	0	1	2
Load inertia ratio *(Pr. 880)*	Manual input	a) Inertia estimation result (RAM) by easy gain tuning is displayed. b) Set the value in the following cases: • Every hour after power-on • When a value other than "1" is set in *Pr. 819* • When vector control is changed to other control (V/F control etc.) using *Pr. 800* c) Write is enabled only during a stop (manual input)	Manual input
Speed control P gain 1 *(Pr. 820)* Speed control integral time 1 *(Pr. 821)* Model speed control gain *(Pr. 828)* Position loop gain *(Pr. 422)*	Manual input	a) Tuning result (RAM) is displayed. b) Set the value in the following cases: • Every hour after power-on • When a value other than "1" is set in *Pr. 819* • When vector control is changed to other control (V/F control etc.) using *Pr. 800* c) Write (manual input) disabled	a) Gain is calculated when "2" is set in *Pr. 819* and the result is set in the parameter. b) When the value is read, the tuning result (parameter setting value) is displayed. c) Write (manual input) disabled

CAUTION

- Performing easy gain tuning with larger inertia than the specified value during vector control may cause malfunction such as hunting. In addition, when the motor shaft is fixed with servo lock or position control, bearing may be damaged. To prevent these, make gain adjustment by manual input without performing easy gain tuning.

(4) Manual input speed control gain adjustment

· Make adjustment when any of such phenomena as unusual machine vibration/noise, low response level and overshoot has occurred.

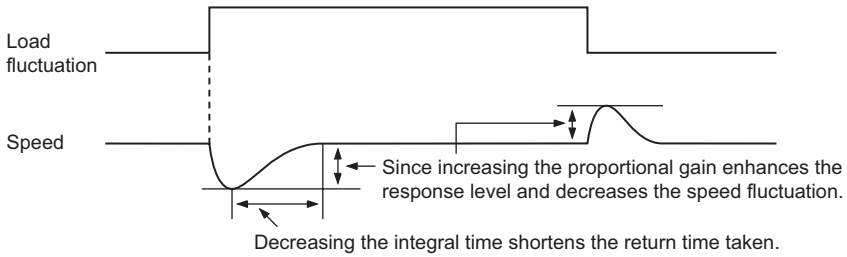


* The values for 75K or higher or for Real sensorless vector control are indicated in parenthesis.

· *Pr. 820 Speed control P gain 1* = "60%" (initial value) is equivalent to 120rad/s (speed response of the motor alone). (Half the value for 75K or higher or for Real sensorless vector control.) Increasing the setting value improves the response level, but a too large gain will produce vibration and/or unusual noise.

· Decreasing the *Pr. 821 Speed control integral time 1* shortens the return time taken at a speed change. However, a too short time will generate an overshoot.

· When there is load inertia, the actual speed gain is as given below.



Actual speed gain = speed gain of motor without load × $\frac{JM}{JM+JL}$

JM: Inertia of the motor
JL: Motor shaft-equivalent load inertia

· Adjustment procedures are as below:
1)Check the conditions and simultaneously change the *Pr. 820* value.
2)If you cannot make proper adjustment, change the *Pr. 821* value and repeat step 1).

No.	Phenomenon/ Condition	Adjustment Method	
1	Load inertia is large	Set the *Pr. 820* and *Pr. 821* values a little higher.	
		Pr. 820	When a speed rise is slow, increase the value 10% by 10% until just before vibration/noise is produced, and set about 0.8 to 0.9 of that value.
		Pr. 821	If an overshoot occurs, double the value until an overshoot does not occur, and set about 0.8 to 0.9 of that value.
2	Vibration/noise generated from mechanical system	Set the *Pr. 820* value a little lower and the *Pr. 821* value a little higher.	
		Pr. 820	Decrease the value 10% by 10% until just before vibration/noise is not produced, and set about 0.8 to 0.9 of that value.
		Pr. 821	If an overshoot occurs, double the value until an overshoot does not occur, and set about 0.8 to 0.9 of that value.
3	Slow response	Set the *Pr. 820* value a little higher.	
		Pr. 820	When a speed rise is slow, increase the value 5% by 5% until just before vibration/noise is produced, and set about 0.8 to 0.9 of that value.
4	Long return time (response time)	Set the *Pr. 821* value a little lower.	
		Decrease the *Pr. 821* value by half until just before an overshoot or the unstable phenomenon does not occur, and set about 0.8 to 0.9 of that value.	
5	Overshoot or unstable phenomenon occurs.	Set the *Pr. 821* value a little higher.	
		Increase the *Pr. 821* value double by double until just before an overshoot or the unstable phenomenon does not occur, and set about 0.8 to 0.9 of that value.	

REMARKS

· When making manual input gain adjustment, set "0" (without easy gain tuning) (initial value) in *Pr. 819 Easy gain tuning selection*.

(5) When using a multi-pole motor (8 poles or more)

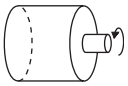
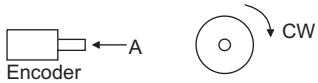
Specially when using a multi-pole motor with more than 8 poles under Real sensorless vector control or vector control, adjust *Pr. 820 Speed control P gain 1* and *Pr. 824 Torque control P gain 1* according to the motor referring to the following methods.

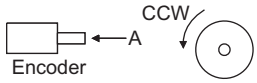
- For *Pr. 820 Speed control P gain 1*, increasing the setting value improves the response level, but a too large gain will produce vibration and/or unusual noise.
- For *Pr. 824 Torque control P gain 1*, note that a too low value will produce current ripples, causing the motor to generate sound synchronizing the cycle of current ripples.

Adjustment method

No.	Phenomenon/Condition	Adjustment Method
1	The motor rotation is unstable in the low speed range.	Set a higher value in *Pr. 820 Speed control P gain 1* according to the motor inertia. Since the self inertia of a multi-pole motor tends to become large, make adjustment to improve the unstable phenomenon, then make fine adjustment in consideration of the response level using that setting as reference. In addition, when performing vector control with encoder, gain adjustment according to the inertia can be easily done using easy gain tuning (*Pr. 819* = 1).
2	Speed trackability is poor	Set a higher value in *Pr. 820 Speed control P gain 1*. Increase the value 10% by 10% until just before vibration or unusual noise is produced, and set about 0.8 to 0.9 of that value. If you cannot make proper adjustment, increase the value of *Pr. 821 Speed control integral time 1* double by double and make adjustment of *Pr. 820* again.
3	Speed variation at the load fluctuation is large	
4	Torque becomes insufficient or torque ripple occurs at starting or in the low speed range under Real sensorless vector control.	Set the speed control gain a little higher. (same as No. 1) If the problem still persists after gain adjustment, increase *Pr. 13 Starting frequency* or set the acceleration time shorter if the inverter is starting to avoid continuous operation in the ultra low speed range.
5	Unusual motor and machine vibration, noise or overcurrent occurs.	Set a lower value in *Pr. 824 Torque control P gain 1*. Decrease the value 10% by 10% until just before the phenomenon is improved, and set about 0.8 to 0.9 of that value.
6	Overcurrent or overspeed (E.OS) occurs at a start under Real sensorless vector control.	

(6) Troubleshooting (speed)

<table>
<tr><th></th><th>Phenomenon</th><th>Cause</th><th>Countermeasures</th></tr>
<tr><td rowspan="5">1</td><td rowspan="5">Motor does not rotate.
(Vector control)</td><td>(1) The motor wiring is wrong</td><td>(1) Wiring check
Select V/F control (set "9999" in Pr. 80 or Pr. 81) and check the rotation direction of the motor.
For the SF-V5RU (1500r/min series), set "170V(340V)" for 3.7kW or less and "160V(320V)" for more in Pr. 19 Base frequency voltage, and set "50Hz" in Pr. 3 Base frequency.
 
When the forward rotation signal is input, the motor running in the counterclockwise direction as viewed from the motor shaft is normal. (If it runs in the clockwise direction, the phase sequence of the inverter secondary side wiring is incorrect.)</td></tr>
<tr><td>(2) Encoder specification selection switch (FR-A7AP/FR-A7AL (option)) is wrong.</td><td>(2) Check the encoder specifications.
Check the encoder specifications selection switch (FR-A7AP/FR-A7AL (option)) of differential/ complementary</td></tr>
<tr><td>(3) The encoder wiring is wrong.</td><td>(3) Check that FWD is displayed when running the motor in the counter-clockwise direction from outside during a stop of the inverter with vector control setting.
If REV is displayed, the encoder phase sequence is wrong.
Perform the correct wiring or match the Pr. 359 Encoder rotation direction.
<table><tr><th>Pr. 359 Setting</th><th>Relationship between the Motor and Encoder</th></tr><tr><td>0</td><td> 

Clockwise direction as viewed from A is forward rotation</td></tr><tr><td>1
(Initial value)</td><td> 

Counter clockwise direction as viewed from A is forward rotation</td></tr></table></td></tr>
<tr><td>(4) The Pr. 369 Number of encoder pulses setting and the number of encoder used are different.</td><td>(4) The motor will not run if the parameter setting is smaller than the number of encoder pulses used. Set the Pr. 369 Number of encoder pulses correctly.</td></tr>
<tr><td>(5) Encoder power specifications are wrong. Or, power is not input.</td><td>(5) Check the power specifications (5V/12V/15V/24V) of encoder and input the external power supply. Make the voltage of the external power supply the same as the encoder output voltage, and connect the external power supply between PG and SD.</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Motor does not run at correct speed. (Speed command does not match actual speed)</td><td>(1) The speed command from the command device is incorrect. The speed command is compounded with noise.</td><td>(1) Check that a correct speed command comes from the command device.
Decrease Pr. 72 PWM frequency selection.</td></tr>
<tr><td>(2) The speed command value does not match the inverter-recognized value.</td><td>(2) Readjust speed command bias/gain Pr. 125, Pr. 126, C2 to C7 and C12 to C15.</td></tr>
<tr><td>(3) The number of encoder pulses setting is incorrect.</td><td>(3) Check the setting of Pr. 369 Number of encoder pulses. (vector control)</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Speed does not rise to the speed command.</td><td>(1) Insufficient torque.
Torque limit is actuated.</td><td>(1) -1 Increase the torque limit value.
(Refer to torque limit of speed control on Chapter 4 of the Instruction Manual (Applied))
(1) -2 Insufficient capacity</td></tr>
<tr><td>(2) Only P (proportional) control is selected.</td><td>(2) When the load is heavy, speed deviation will occur under P (proportional) control. Select PI control.</td></tr>
</table>

	Phenomenon	Cause	Countermeasures
4	Motor speed is unstable.	(1) The speed command varies.	(1) -1 Check that a correct speed command comes from the command device. (Take measures against noises.) (1) -2 Decrease *Pr. 72 PWM frequency selection*. (1) -3 Increase *Pr. 822 Speed setting filter 1*. *(Refer to Chapter 4 of the Instruction Manual (Applied))*
		(2) Insufficient torque.	(2) Increase the torque limit value. (Refer to torque limit of speed control on *Chapter 4 of the Instruction Manual (Applied)*)
		(3) The speed control gains do not match the machine. (mechanical resonance)	(3) -1 Perform easy gain tuning. *(Refer to page 76)* (3) -2 Adjust *Pr. 820, Pr. 821*. *(Refer to page 78)* (3) -3 Perform speed feed forward/model adaptive speed control.
5	Motor or machine hunts (vibration/noise is produced).	(1) The speed control gain is high.	(1) -1 Perform easy gain tuning. *(Refer to page 76)* (1) -2 Decrease *Pr. 820* and increase *Pr. 821*. (1) -3 Perform speed feed forward control and model adaptive speed control.
		(2) The torque control gain is high.	(2) Decrease the *Pr. 824* value. *(Refer to Chapter 4 of the Instruction Manual (Applied))*
		(3) The motor wiring is wrong.	(3) Check the wiring
6	Acceleration/deceleration time does not match the setting.	(1) Insufficient torque.	(1) -1 Increase the torque limit value. (Refer to torque limit of speed control on *Chapter 4 of the Instruction Manual (Applied)*) (1) -2 Perform speed feed forward control.
		(2) Large load inertia.	(2) Set the acceleration/deceleration time that meets the load.
7	Machine operation is unstable	(1) The speed control gains do not match the machine.	(1) -1 Perform easy gain tuning. *(Refer to page 76)* (1) -2 Adjust *Pr. 820, Pr. 821*. *(Refer to page 78)* (1) -3 Perform speed feed forward control and model adaptive speed control.
		(2) Slow response because of improper acceleration/ deceleration time of the inverter.	(2) Change the acceleration/deceleration time to an optimum value.
8	Speed fluctuates at low speed.	(1) Adverse effect of high carrier frequency.	(1) Decrease *Pr. 72 PWM frequency selection*.
		(2) Low speed control gain.	(2) Increase *Pr. 820 Speed control P gain 1*.

3.3 Start/stop using the operation panel (PU operation)

POINT

From where is the frequency command given?

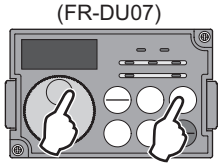
- **Operation at the frequency set in the frequency setting mode of the operation panel** →*Refer to 3.3.1 (Refer to page 82)*
- **Operation using the setting dial as the potentiometer**→*Refer to 3.3.2 (Refer to page 83)*
- **Change of frequency with ON/OFF switches connected to terminals** →*Refer to 3.3.3 (Refer to page 84)*
- **Perform frequency setting using voltage input signal**→*Refer to 3.3.4 (Refer to page 85)*
- **Perform frequency setting using current input signal**→*Refer to 3.3.5 (Refer to page 86)*

3.3.1 Setting the frequency to operate (example: performing operation at 30Hz)

POINT

Operation panel (FR-DU07) is used to give both of frequency and start commands in PU operation.

Operation panel
(FR-DU07)



Operation example | Performing operation at 30Hz.

Operation

1. Screen at power-ON

The monitor display appears.

2. Operation mode change

Press (PU/EXT) to choose the PU operation mode. [PU] indicator is lit.

3. Frequency setting

Turn  to show the frequency "30.00" (30.00Hz) you want to set. The frequency flickers for about 5s. While the value is flickering, press (SET) to set the frequency. "F" and "30.00" flicker alternately. After the value flickered for about 3s, the display returns to " 0.00" (monitor display).

(If you do not press (SET), the value flickers for about 5s and the display then returns to " 0.00" (0.00Hz). In that case, turn  again, and set the frequency.)

4. Start → acceleration → constant speed

Press (FWD) or (REV) to start running. The frequency on the indicator increases by the *Pr. 7 Acceleration time*, and "30.00" (30.00Hz) appears. (To change the set frequency, perform the operation in above step 3. Starting from the previously set frequency.)

5. Deceleration → Stop

Press (STOP/RESET) to stop.

The frequency on the indicator decreases by the *Pr. 8 Deceleration time*, and the motor stops rotating with " 0.00" (0.00Hz) displayed on the indicator.

REMARKS

- Press  to show the set frequency under PU operation mode or External/PU combined operation mode 1 (*Pr. 79* = "3").

-  can also be used like a potentiometer to perform operation. *(Refer to page 83)*

3.3.2 Using the setting dial like a potentiometer to perform operation.

POINT

Set "1" (setting dial potentiometer mode) in *Pr. 161 Frequency setting/key lock operation selection*.

Operation example | Change the frequency from 0Hz to 60Hz during operation

Operation

1. Screen at power-ON
The monitor display appears.

2. Operation mode change
Press (PU/EXT) to choose the PU operation mode. [PU] indicator is lit.

3. Parameter setting change
Change *Pr. 161* to the setting value " 1 ". *(Refer to page 53* to change the setting.*)*

4. Start
Press (FWD) (or (REV)) to start the inverter.

5. Frequency setting
Turn  until "60.00" appears. The flickering frequency is the set frequency. (The frequency flickers for about 5s.)
You need not press (SET).

REMARKS

· If flickering "60.00" turns to "0.0", the *Pr. 161 Frequency setting/key lock operation selection* setting may not be "1".

· Independently of whether the inverter is running or at a stop, the frequency can be set by merely turning  .

CAUTION

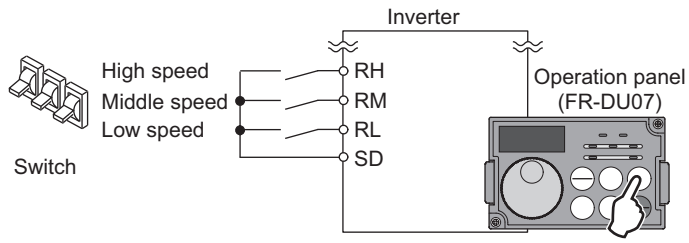
· When the setting dial is turned the frequency goes up to the set value of *Pr. 1 Maximum frequency* (initial value is 120Hz for 55K or lower/60Hz for 75K or higher).
Adjust the setting of *Pr. 1 Maximum frequency* according to the application.

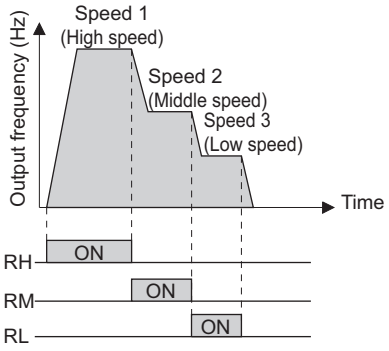
3.3.3 Setting the frequency by switches (multi-speed setting)

POINT

- Use (FWD) or (REV) on the operation panel (FR-DU07) to give a start command.
- Switch ON the RH, RM, or RL signal to give a frequency command. (Multi-speed setting)
- Set "4" (External/PU combination operation mode 2) in *Pr. 79 Operation mode selection.*

[Connection diagram]





Operation example | Operate in low-speed (10Hz).

Operation

1. Screen at power-ON
The monitor display appears.

2. Operation mode change
Set "4" in *Pr. 79*. [PU] indicator and [EXT] indicator are lit. *(Refer to page 53* to change the setting.*)*

3. Frequency setting
Turn ON the low-speed switch (RL).

4. Start → Acceleration → constant speed
Press (FWD) or (REV) to start running. The frequency on the indicator increases by the *Pr. 7 Acceleration time*, and "10.00" (10.00Hz) appears.

5. Deceleration → stop
Press (STOP RESET) to stop. The frequency on the indicator decreases by the *Pr. 8 Deceleration time*, and the motor stops rotating with "0.00" (0.00Hz) displayed on the indicator. Turn OFF the low-speed switch (RL).

REMARKS

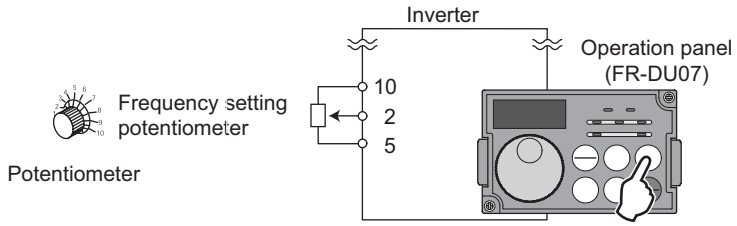
- Initial value of terminal RH, RM, and RL are 60Hz, 30Hz, and 10Hz. (To change, set *Pr. 4*, *Pr. 5*, and *Pr. 6*.)
- In the initial setting, when two or more of multi-speed settings are simultaneously selected, priority is given to the set frequency of the lower signal. For example, when RH and RM signals turn ON, RM signal (*Pr. 5*) has a higher priority.
- Maximum of 15-speed operation can be performed. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*

3.3.4 Setting the frequency by analog input (voltage input)

POINT

- Use (FWD) or (REV) on the operation panel (FR-DU07) to give a start command.
- Use the potentiometer to give a frequency command. (by connecting terminal 2 and 5 (voltage input))
- Set "4" (External/PU combination operation mode 2) in *Pr. 79 Operation mode selection*.

[Connection diagram]
(The inverter supplies 5V of power to the frequency setting potentiometer.(Terminal 10))



Operation example | Performing operation at 60Hz.

Operation

1.	Screen at power-ON The monitor display appears.
2.	Operation mode change Set "4" in *Pr. 79*. [PU] indicator and [EXT] indicator are lit. *(Refer to page 53* to change the setting.*)*
3.	Start Press (FWD) or (REV). [FWD] or [REV] is flickering as no frequency command is given.
4.	Acceleration → constant speed Turn the potentiometer (frequency setting potentiometer) clockwise slowly to full. The frequency value on the indicator increases according to *Pr. 7 Acceleration time* until "60.00"(60Hz) is displayed.
5.	Deceleration Turn the potentiometer (frequency setting potentiometer) counterclockwise slowly to full. The frequency on the indicator decreases by the *Pr. 8 Deceleration time*, and the motor stops rotating with " 0.00" (0.00Hz) displayed on the indicator. [FWD] indicator or [REV] indicator flickers.
6.	Stop Press (STOP RESET). [FWD] indicator or [REV] indicator turns OFF.

? Change the frequency (60Hz) of the maximum value of potentiometer (at 5V, initial value)
☞ Adjust the frequency in *Pr. 125 Terminal 2 frequency setting gain frequency. (Refer to page 90.)*

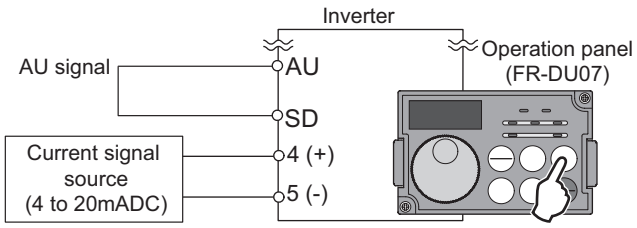
? Change the frequency (0Hz) of the minimum value of potentiometer (at 0V, initial value)
☞ Adjust the frequency in *calibration parameter C2 Terminal 2 frequency setting bias frequency. (Refer to Chapter 4 of the Instruction Manual (Applied).)*

3.3.5 Setting the frequency by analog input (current input)

POINT

- Use (FWD) or (REV) on the operation panel (FR-DU07) to give a start command.
- Use the current signal source (4 to 20mA) to give a frequency command (by connecting between terminals 4 and 5 (current input)).
- Turn the AU signal ON.
- Set "4" (External/PU combination operation mode 2) in *Pr. 79 Operation mode selection*.

[Connection diagram]



Operation example | Performing operation at 60Hz.

Operation

1.	Screen at power-ON The monitor display appears.
2.	Operation mode change Set "4" in *Pr. 79*. [PU] indicator and [EXT] indicator are lit. *(Refer to page 53* to change the setting.*)*
3.	Start Check that the terminal 4 input selection signal (AU) is ON. Press (FWD) or (REV). [FWD] or [REV] is flickering as no frequency command is given.
4.	Acceleration → constant speed Perform 20mA input. The frequency on the indicator increases by the *Pr. 7 Acceleration time* and "60.00" (60.00Hz) appears.
5.	Deceleration Input 4mA or less. The frequency on the indicator decreases by the *Pr. 8 Deceleration time*, and the motor stops rotating with " 0.00" (0.00Hz) displayed on the indicator. [FWD] indicator or [REV] indicator flickers.
6.	Stop Press (STOP RESET). [FWD] indicator or [REV] indicator turns OFF.

REMARKS

Pr. 184 AU terminal function selection must be set to "4" (AU signal) (initial value). *(Refer to Chapter 4 of the Instruction Manual (Applied).)*

? Change the frequency (60Hz) at the maximum value of potentiometer (at 20mA, initial value)
☞ Adjust the frequency in *Pr. 126 Terminal 4 frequency setting gain frequency. (Refer to page 92.)*

? Change the frequency (0Hz) at the minimum value of potentiometer (at 4mA, initial value)
☞ Adjust the frequency in *calibration parameter C5 Terminal 4 frequency setting bias frequency. (Refer to Chapter 4 of the Instruction Manual (Applied).)*

3.4 Start and stop using terminals (External operation)

POINT

From where is the frequency command given?

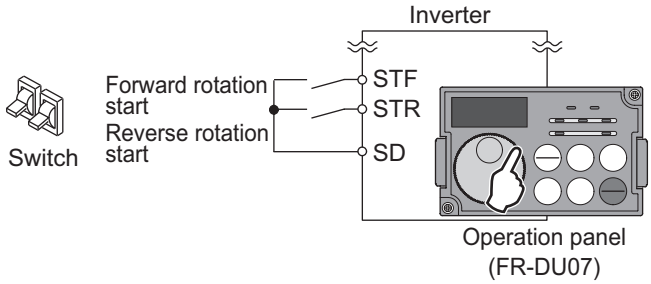
- **Operation at the frequency set in the frequency setting mode of the operation panel** → *Refer to 3.4.1 (Refer to page 87)*
- **Give a frequency command by switch (multi-speed setting)** → *Refer to 3.4.2 (Refer to page 88)*
- **Perform frequency setting using voltage input signal** → *Refer to 3.4.3 (Refer to page 89)*
- **Perform frequency setting using current input signal** → *Refer to 3.4.5 (Refer to page 91)*

3.4.1 Setting the frequency by the operation panel (Pr. 79 = 3)

POINT

- Switch ON the STF (STR) signal to give a start command.
- Use ( ) on the operation panel (FR-DU07) to give a frequency command.
- Set "3" (External/PU combination operation mode 1) in *Pr. 79 Operation mode selection*.

[Connection diagram]



Operation example | Performing operation at 30Hz.

Operation

1. Screen at power-ON
The monitor display appears.

2. Operation mode change
Set "3" in *Pr. 79*. [PU] indicator and [EXT] indicator are lit. *(Refer to page 53* to change the setting.*)*

3. Frequency setting
Turn to show the selected frequency, "30.00" (30.00Hz). The frequency flickers for about 5s.
While the value is flickering, press (SET) to set the frequency. "F" and "30.00" flicker alternately.
After about 3s of flickering of the value, the indicator goes back to "0.00" (monitor display).
(If you do not press (SET), the value flickers for about 5s and the display then returns to 0.00 (display) Hz. In that case, turn again, and set the frequency.)

4. Start → acceleration → constant speed
Turn ON the start switch (STF or STR). The frequency on the indicator increases by the *Pr. 7 Acceleration time*, and "30.00" (30.00Hz) appears. [FWD] indicator is lit during forward rotation, and [REV] indicator is lit during reverse rotation. (To change the set frequency, perform the operation in above step 3. Starting from the previously set frequency.)

5. Deceleration → stop
Turn OFF the start switch (STF or STR). The frequency on the indicator decreases by the *Pr. 8 Deceleration time*, and the motor stops rotating with "0.00" (0.00Hz) displayed on the indicator.

CAUTION

When both of STF and STR signals are turned ON, the motor cannot start. If both are turned ON while the motor is running, the motor decelerates to a stop.

REMARKS

- *Pr. 178 STF terminal function selection* must be set to "60" (or *Pr. 179 STR terminal function selection* must be set to "61"). (all are initial values)
- When *Pr. 79 Operation mode selection* is set to "3", multi-speed operation (refer to *page 88*) is also valid.

? When the inverter is stopped by (STOP RESET) of the operation panel (FR-DU07), PS and 0.00 Hz MON PU EXT FWD are displayed alternately. (Flickering)

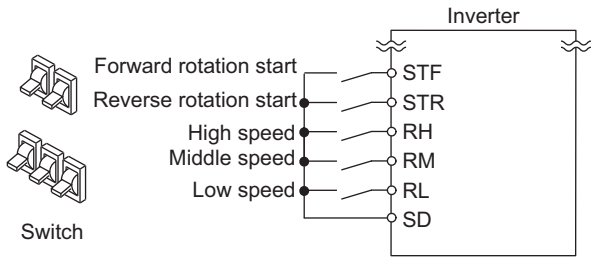
☞ 1. Turn the start switch (STF or STR) OFF.
2. The display can be reset by (PU EXT).

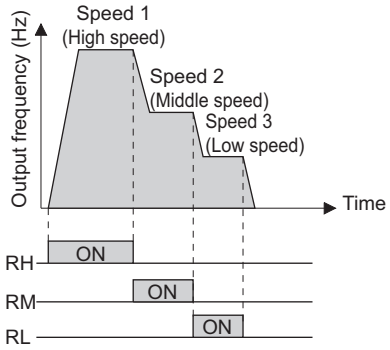
3.4.2 Setting the frequency by switches (multi-speed setting) (Pr. 4 to Pr. 6)

POINT

- Switch ON the STF (STR) signal to give a start command.
- Switch ON the RH, RM, or RL signal to give a frequency command. (Multi-speed setting)

[Connection diagram]





Changing example | Operation at high speed (60Hz).

Operation

1. Screen at power-ON
The monitor display appears.

2. Frequency setting
Turn ON the high-speed switch (RH).

3. Start → acceleration → constant speed
Turn ON the start switch (STF or STR). The frequency on the indicator increases by the *Pr. 7 Acceleration time*, and "60.00" (60.00Hz) appears. [FWD] indicator is lit during forward rotation, and [REV] indicator is lit during reverse rotation.
- When RM is turned ON, 30Hz is displayed.
  When RL is turned ON, 10Hz is displayed.

4. Deceleration → stop
Turn OFF the start switch (STF or STR). The frequency on the indicator decreases by the *Pr. 8 Deceleration time*, and the motor stops rotating with "0.00" (0.00Hz) displayed on the indicator. [FWD] indicator or [REV] indicator turns OFF. Turn OFF the high-speed switch (RH).

CAUTION

When both of STF and STR signals are turned ON, the motor cannot start. If both are turned ON while the motor is running, the motor decelerates to a stop.

REMARKS

- Initial value of terminal RH, RM, and RL are 60Hz, 30Hz, and 10Hz. (To change, set *Pr. 4*, *Pr. 5*, and *Pr. 6*.)
- In the initial setting, when two or more of multi-speed settings are simultaneously selected, priority is given to the set frequency of the lower signal. For example, when RH and RM signals turn ON, RM signal (*Pr. 5*) has a higher priority.
- Maximum of 15-speed operation can be performed. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*

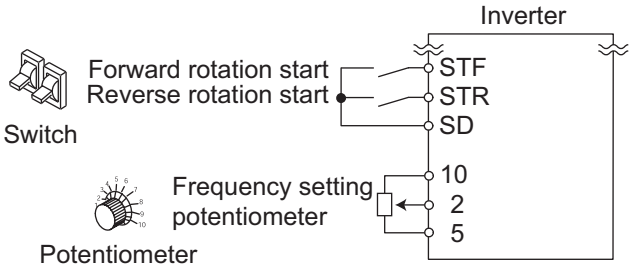
3.4.3 Setting the frequency by analog input (voltage input)

POINT

- Switch ON the STF (STR) signal to give a start command.
- Use the potentiometer (by connecting terminal 2 and 5 (voltage input)) to give a frequency command.

[Connection diagram]

(The inverter supplies 5V of power to frequency setting potentiometer. (Terminal 10))



Operation example Performing operation at 60Hz.

Operation

1.	Screen at power-ON The monitor display appears.
2.	Start Turn the start switch (STF or STR) on. [FWD] or [REV] is flickering as no frequency command is given.
3.	Acceleration → constant speed Turn the potentiometer (frequency setting potentiometer) clockwise slowly to full. The frequency on the indicator increases by the *Pr. 7 Acceleration time*, and "60.00" (60.00Hz) appears. [FWD] indicator is lit during forward rotation, and [REV] indicator is lit during reverse rotation.
4.	Deceleration Turn the potentiometer (frequency setting potentiometer) counterclockwise slowly to full. The frequency on the indicator decreases by the *Pr. 8 Deceleration time*, and the motor stops rotating with " 0.00" (0.00Hz) displayed on the indicator. [FWD] indicator or [REV] indicator flickers.
5.	Stop Turn the start switch (STF or STR) off. [FWD] indicator or [REV] indicator turns OFF.

CAUTION

When both of STF and STR signals are turned ON, the motor cannot start. If both are turned ON while the motor is running, the motor decelerates to a stop.

REMARKS

Pr. 178 STF terminal function selection must be set to "60" (or *Pr. 179 STR terminal function selection* must be set to "61").
(all are initial values)

3.4.4 Changing the output frequency (60Hz, initial value) at the maximum voltage input (5V, initial value)

<How to change the maximum frequency>

Changing example

When you use the 0 to 5VDC input and want to change the frequency at 5V from 60Hz (initial value) to 50Hz, set "50Hz" in *Pr. 125*.

Operation

1. Selecting the parameter number

Turn ◎ until P. 125 (*Pr. 125*) appears.

Press (SET) to show the present set value. (60.00Hz)

2. Changing the maximum frequency

Turn ◎ to change the set value to "50.00". (50.00Hz).

Press (SET) to set. "50.00" and "P. 125" flicker alternately.

3. Mode/monitor check

Press (MODE) twice to choose the monitor/frequency monitor.

4. Start

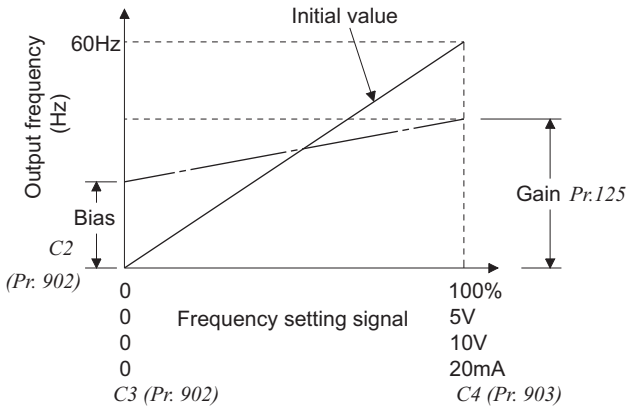
To check the setting, turn the start switch (STF or STR) ON and input 5V (turn the potentiometer clockwise slowly to full.) (Refer to 3.4.3 steps 2 and 3)

? The frequency meter (indicator) connected across terminals FM and SD does not indicate exactly 50Hz ... Why?

☞ The meter can be adjusted by *calibration parameter C0 FM terminal calibration*. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*

? Set frequency at 0V using *calibration parameter C2* and adjust the indicator using *calibration parameter C0*.

(Refer to Chapter 4 of the Instruction Manual (Applied).)



REMARKS

As other adjustment methods of frequency setting voltage gain, there are methods to adjust with a voltage applied across terminals 2 and 5 or adjust at any point without a voltage applied.

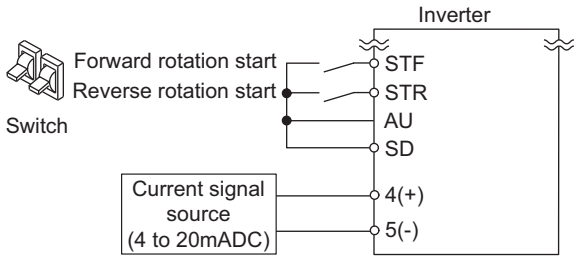
(Refer to *Chapter 4 of the Instruction Manual (Applied)* for the setting method of *calibration parameter C4*.)

3.4.5 Setting the frequency by analog input (current input)

POINT

- Switch ON the STF (STR) signal to give a start command.
- Turn the AU signal ON.
- Set "2" (External operation mode) in *Pr. 79 Operation mode selection.*

[Connection diagram]



Operation example Performing operation at 60Hz.

Operation

1.	Screen at power-ON The monitor display appears.
2.	Start Check that the terminal 4 input selection signal (AU) is ON. Turn the start switch (STF or STR) ON. [FWD] or [REV] is flickering as no frequency command is given
3.	Acceleration → constant speed Perform 20mA input. The frequency on the indicator increases by the *Pr. 7 Acceleration time*, and "60.00" (60.00Hz) appears. [FWD] indicator is lit during forward rotation, and [REV] indicator is lit during reverse rotation.
4.	Deceleration Input 4mA or less. The frequency on the indicator decreases by the *Pr. 8 Deceleration time*, and the motor stops rotating with " 0.00" (0.00Hz) displayed on the indicator. [FWD] indicator or [REV] indicator flickers.
5.	Stop Turn the start switch (STF or STR) OFF. [FWD] indicator or [REV] indicator turns OFF.

CAUTION

When both of STF and STR signals are turned ON, the motor cannot start. If both are turned ON while the motor is running, the motor decelerates to a stop.

REMARKS

Pr. 184 AU terminal function selection must be set to "4" (AU signal) (initial value). *(Refer to Chapter 4 of the Instruction Manual (Applied).)*

3.4.6 Changing the output frequency (60Hz, initial value) at the maximum current input (at 20mA, initial value)

<How to change the maximum frequency?>

Changing example

When you use the 4 to 20mA input and want to change the frequency at 20mA from 60Hz (initial value) to 50Hz, set "50Hz" in *Pr. 126*.

Operation

1. Selecting the parameter number

Turn ◎ until P. 126 (*Pr. 126*) appears.

Press (SET) to show the present set value. (60.00Hz)

2. Changing the maximum frequency

Turn ◎ to change the set value to "50.00". (50.00Hz)

Press (SET) to set the value. "50.00" and "P. 126" flicker alternately.

3. Mode/monitor check

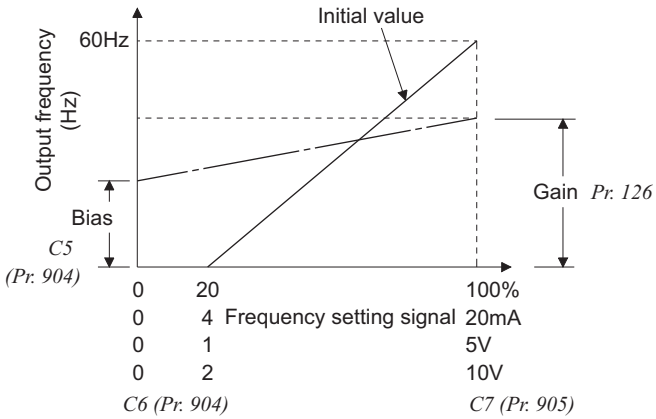
Press (MODE) twice to choose the monitor/frequency monitor.

4. Start

To check the setting, turn the start switch (STF or STR) ON and input 20mA. (Refer to 3.4.5 steps 2 and 3)

? Set frequency at 4mA using *calibration parameter C5* and adjust the indicator using *calibration parameter C0*.

(Refer to Chapter 4 of the Instruction Manual (Applied).)



REMARKS

As other adjustment methods of frequency setting voltage gain, there are methods to adjust with a voltage applied across terminals 4 and 5 or adjust at any point without a voltage applied.

(Refer to *Chapter 4 of the Instruction Manual (Applied)* for the setting method of *calibration parameter C7*.)

3.5 Parameter List

3.5.1 List of parameters classified by the purpose

Set the parameters according to the operating conditions. The following list indicates purpose of use and corresponding parameters.

Purpose of Use		Parameter Number
Control mode	Change the control method	Pr. 80, Pr. 81, Pr. 451, Pr. 800
Speed control by Real sensorless vector control and vector control	Torque limit level setting for speed control	Pr. 22, Pr. 803, Pr. 810 to Pr. 817, Pr. 858, Pr. 868, Pr. 874
	To perform high accuracy/fast response operation (gain adjustment of Real sensorless vector control and vector control)	Pr. 818 to Pr. 821, Pr. 830, Pr. 831, Pr. 880
	Speed feed forward control, model adaptive speed control	Pr. 828, Pr. 877 to Pr. 881
	Torque bias function	Pr. 840 to Pr. 848
	Prevent the motor from overrunning	Pr. 285, Pr. 853, Pr. 873
	Notch filter	Pr. 862, Pr. 863
Torque control by Real sensorless vector control and vector control	Torque command	Pr. 803 to Pr. 806
	Speed limit	Pr. 807 to Pr.809
	Gain adjustment for torque control	Pr. 824, Pr. 825, Pr. 834, Pr. 835
Position control by vector control	Simple position feed function by contact input	Pr. 419, Pr. 464 to Pr. 494
	Position control by pulse train input of the inverter	Pr. 419, Pr. 428 to Pr. 430
	Setting the electronic gear	Pr. 420, Pr. 421, Pr. 424
	Setting of positioning adjustment parameter	Pr. 426, Pr. 427
	Gain adjustment of position control	Pr. 422, Pr. 423, Pr. 425
Adjust the output torque of the motor (current)	Manual torque boost	Pr. 0, Pr. 46, Pr. 112
	Advanced magnetic flux vector control	Pr. 80, Pr. 81, Pr. 89, Pr. 453, Pr. 454, Pr. 569
	Real sensorless vector control	Pr. 80, Pr. 81, Pr. 451, Pr. 800
	Slip compensation	Pr. 245 to Pr. 247
	Stall prevention operation	Pr. 22, Pr. 23, Pr. 48, Pr. 49, Pr. 66, Pr. 114, Pr. 115, Pr. 148, Pr. 149, Pr. 154, Pr. 156, Pr. 157, Pr. 858, Pr. 868
	Torque limit	Pr. 22, Pr. 803, Pr. 810, Pr. 812 to Pr. 817, Pr. 858, Pr. 868, Pr. 874
Limit the output frequency	Maximum/minimum frequency	Pr. 1, Pr. 2, Pr. 18
	Avoid mechanical resonance points (frequency jump)	Pr. 31 to Pr. 36
	Speed limit	Pr. 807 to Pr. 809
Set V/F pattern	Base frequency, voltage	Pr. 3, Pr. 19, Pr. 47, Pr. 113
	V/F pattern matching applications	Pr. 14
	Adjustable 5 points V/F	Pr. 71, Pr. 100 to Pr. 109
Frequency setting with terminals (contact input)	Multi-speed setting operation	Pr. 4 to Pr. 6, Pr. 24 to Pr. 27, Pr. 232 to Pr. 239
	Jog operation	Pr. 15, Pr. 16
	Input compensation of multi-speed and remote setting	Pr. 28
	Remote setting function	Pr. 59

Purpose of Use		Parameter Number
Acceleration/deceleration time/pattern adjustment	Acceleration/deceleration time setting	Pr. 7, Pr. 8, Pr. 20, Pr. 21, Pr. 44, Pr. 45, Pr. 110, Pr. 111
	Starting frequency	Pr. 13, Pr. 571
	Acceleration/deceleration pattern and backlash measures	Pr. 29, Pr. 140 to Pr. 143, Pr.380 to Pr. 383, Pr. 516 to Pr. 519
	Set a shortest and optimum acceleration/deceleration time automatically. (Automatic acceleration/deceleration)	Pr. 61 to Pr. 64, Pr. 292, Pr. 293
	Regeneration avoidance functions at deceleration	Pr. 882 to Pr. 886, Pr. 665
Selection and protection of a motor	Motor protection from overheat (electronic thermal relay function)	Pr. 9, Pr. 51
	Use the constant-torque motor (applied motor)	Pr. 71, Pr. 450
	Offline auto tuning	Pr. 82 to Pr. 84, Pr. 90 to Pr. 94, Pr. 96, Pr. 455 to Pr. 463, Pr. 684, Pr. 859, Pr. 860
	Online auto tuning	Pr. 95, Pr. 574
	Easy gain tuning	Pr. 818, Pr. 819
Motor brake and stop operation	DC injection brake	Pr. 10 to Pr. 12, Pr. 850
	Selection of regeneration unit and DC current feeding	Pr. 30, Pr. 70
	Selection of motor stopping and start command method	Pr. 250
	Decelerate the motor to a stop at instantaneous power failure	Pr. 261 to Pr. 266, Pr. 294
	Stop-on-contact control	Pr. 6, Pr. 270, Pr. 275, Pr. 276
	Brake sequence function	Pr. 278 to Pr. 285, Pr. 292
Function assignment of external terminal and control	Function assignment of input terminal	Pr. 178 to Pr. 189
	Start signal selection	Pr. 250
	Logic selection of output stop signal (MRS)	Pr. 17
	Selection of action conditions of the second (third) function signal (RT(X9))	Pr. 155
	Terminal assignment of output terminal	Pr. 190 to Pr. 196
	Detection of output frequency (SU, FU, FU2, FU3, FB, FB2, FB3, LS signal)	Pr. 41 to Pr. 43, Pr. 50, Pr. 116, Pr. 865
	Detection of output current (Y12 signal) Detection of zero current (Y13 signal)	Pr. 150 to Pr. 153, Pr. 166, Pr. 167
	Remote output function (REM signal)	Pr. 495 to Pr. 497
Monitor display and monitor output signal	Speed display and speed setting	Pr. 37, Pr. 144
	Change of DU/PU monitor descriptions Cumulative monitor clear	Pr. 52, Pr. 170, Pr. 171, Pr. 563, Pr. 564, Pr. 891
	Change of the monitor output from terminal FM and AM	Pr. 54 to Pr. 56, Pr. 158, Pr. 866, Pr. 867
	Adjustment of terminal FM and AM (calibration)	C0 (Pr. 900), C1 (Pr. 901)
	Energy saving monitor	Pr. 891 to Pr. 899
Detection of output frequency, current and torque	Detection of output frequency (SU, FU, FU2, FU3, FB, FB2, FB3, LS signal)	Pr. 41 to Pr. 43, Pr. 50, Pr. 116, Pr. 865
	Detection of output current (Y12 signal) Detection of zero current (Y13 signal)	Pr. 150 to Pr. 153, Pr. 166, Pr. 167
	Torque detection (TU signal)	Pr. 864
Operation selection at power failure and instantaneous power failure	Restart operation after instantaneous power failure/Flying start	Pr. 57, Pr. 58, Pr. 162 to Pr. 165, Pr. 299, Pr. 611
	Decelerate the motor to a stop at instantaneous power failure	Pr. 261 to Pr. 266, Pr. 294
Operation setting at fault occurrence	Retry function at fault occurrence	Pr. 65, Pr. 67 to Pr. 69
	Output function of fault code	Pr. 76
	Input/output phase failure protection selection	Pr. 251, Pr. 872
	Fault definition	Pr. 875
	Regeneration avoidance function	Pr. 882 to Pr. 886, Pr. 665

Purpose of Use		Parameter Number
Energy saving operation	Energy saving control selection	Pr. 60
	How much energy can be saved (energy saving monitor)	Pr. 891 to Pr. 899
Reduction of the motor noise Measures against noise and leakage currents	Carrier frequency and SoftPWM selection	Pr. 72, Pr. 240
	Noise elimination at the analog input	Pr. 74, Pr. 822, Pr. 826, Pr. 832, Pr. 836, Pr. 849
Frequency setting by analog input	Analog input selection	Pr. 73, Pr. 267
	Override function	Pr. 73, Pr. 252, Pr. 253
	Noise elimination at the analog input	Pr. 74, Pr. 822, Pr. 826, Pr. 832, Pr. 836, Pr. 849
	Change of analog input frequency, adjustment of voltage, current input and frequency (calibration)	Pr. 125, Pr. 126, Pr. 241, C2 to C7 (Pr. 902 to Pr. 905)
	Compensation at the analog input	Pr. 242, Pr. 243
Misoperation prevention and parameter setting restriction	Reset selection, disconnected PU detection	Pr. 75
	Prevention of parameter rewrite Password function	Pr. 77 Pr. 296, Pr. 297
	Prevention of reverse rotation of the motor	Pr. 78
	Display necessary parameters only. (user group)	Pr. 160, Pr. 172 to Pr. 174
	Control of parameter write by communication	Pr. 342
Selection of operation mode and operation location	Operation mode selection	Pr. 79
	Operation mode when power is on	Pr. 79, Pr. 340
	Operation command source and speed command source during communication operation	Pr. 338, Pr. 339
	Selection of the NET mode operation control source	Pr. 550
	Selection of the PU mode operation control source	Pr. 551
Communication operation and setting	PU connector communication	Pr. 117 to Pr. 124, Pr. 331 to Pr. 337, Pr. 341
	Control of parameter write by communication	Pr. 342
	Modbus-RTU communication specifications	Pr. 343, Pr. 539
	Operation command source and speed command source during communication operation	Pr. 338, Pr. 339
	Use setup software (USB communication)	Pr. 547, Pr. 548
	Selection of the NET mode operation control source	Pr. 550
	Modbus-RTU protocol (communication protocol selection)	Pr. 549
Special operation and frequency control	PID control	Pr. 127 to Pr. 134, Pr. 575 to Pr. 577
	Switch between the inverter operation and commercial power-supply operation to use	Pr. 135 to Pr. 139, Pr. 159
	Operate at a high speed when a load is light. (load torque high speed frequency control)	Pr. 4, Pr. 5, Pr. 270 to Pr. 274
	Droop control	Pr. 286 to Pr. 288
	Frequency control by pulse train input	Pr. 291, Pr. 384 to Pr. 386
Useful functions	Free parameter	Pr. 888, Pr. 889
	Increase cooling fan life	Pr. 244
	To determine the maintenance time of parts.	Pr. 255 to Pr. 259, Pr. 503, Pr. 504
	How much energy can be saved (energy saving monitor)	Pr. 60, Pr. 891 to Pr. 899
Setting from the parameter unit and operation panel	Parameter unit language switchover	Pr. 145
	Operation selection of the operation panel	Pr. 161
	Buzzer control of the operation panel	Pr. 990
	Contrast adjustment of the parameter unit	Pr. 991

3.5.2 Parameter list

· ◎ indicates simple mode parameters.
· "○" indicates enabled and "×" indicates disabled of "parameter copy", "parameter clear", and "all parameter clear".
· "○*" indicates a communication parameter which is not cleared by parameter clear (all clear) from the RS-485 communication.

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Manual torque boost V/F	0 ◎		Torque boost	0.1%	6/4/3/2/1% *	0 to 30%	Set the output voltage at 0Hz as %. * The initial value differs according to the inverter capacity. (0.4K, 0.75K / 1.5K to 3.7K / 5.5K, 7.5K / 11K to 55K / 75K or higher)	○	○	○
		46	Second torque boost	0.1%	9999	0 to 30%	Set the torque boost when the RT signal is on.	○	○	○
						9999	Without second torque boost			
		112	Third torque boost	0.1%	9999	0 to 30%	Set the torque boost when the X9 signal is on.	○	○	○
						9999	Without third torque boost			
Maximum/minimum frequency V/F	1 ◎		Maximum frequency	0.01Hz	120/60Hz*	0 to 120Hz	Set the upper limit of the output frequency. * The initial value differs according to the inverter capacity. (55K or lower/75K or higher)	○	○	○
	2 ◎		Minimum frequency	0.01Hz	0Hz	0 to 120Hz	Set the lower limit of the output frequency.	○	○	○
		18	High speed maximum frequency	0.01Hz	120/60Hz*	120 to 400Hz	Set when performing the operation at 120Hz or more. * The initial value differs according to the inverter capacity. (55K or lower/75k or higher)	○	○	○
Base frequency, voltage	3 ◎		Base frequency	0.01Hz	60Hz	0 to 400Hz	Set the frequency when the motor rated torque is generated. (50Hz/60Hz)	○	○	○
		19	Base frequency voltage	0.1V	9999	0 to 1000V	Set the base voltage.	○	○	○
						8888	95% of power supply voltage			
						9999	Same as power supply voltage			
		47	Second V/F (base frequency)	0.01Hz	9999	0 to 400Hz	Set the base frequency when the RT signal is on.	○	○	○
						9999	Second V/F is invalid			
		113	Third V/F (base frequency)	0.01Hz	9999	0 to 400Hz	Set the base frequency when the X9 signal is ON.	○	○	○
						9999	Third V/F is invalid			
Multi-speed setting operation	4 ◎		Multi-speed setting (high speed)	0.01Hz	60Hz	0 to 400Hz	Set frequency when the RH signal is on.	○	○	○
	5 ◎		Multi-speed setting (middle speed)	0.01Hz	30Hz	0 to 400Hz	Set frequency when the RM signal is on.	○	○	○
	6 ◎		Multi-speed setting (low speed)	0.01Hz	10Hz	0 to 400Hz	Set frequency when the RL signal is on.	○	○	○
		24 to 27	Multi-speed setting (4 speed to 7 speed)	0.01Hz	9999	0 to 400Hz, 9999	Frequency from 4 speed to 15 speed can be set according to the combination of the RH, RM, RL and REX signals. 9999: not selected	○	○	○
		232 to 239	Multi-speed setting (8 speed to 15 speed)	0.01Hz	9999	0 to 400Hz, 9999		○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Acceleration/deceleration time setting	7	◎	Acceleration time	0.1/ 0.01s	5/15s *	0 to 3600/ 360s	Set the motor acceleration time. * The initial value differs according to the inverter capacity. (7.5K or lower/11K or higher)	○	○	○
	8	◎	Deceleration time	0.1/ 0.01s	5/15s *	0 to 3600/ 360s	Set the motor deceleration time. * The initial value differs according to the inverter capacity. (7.5K or lower/11K or higher)	○	○	○
		20	Acceleration/ deceleration reference frequency	0.01Hz	60Hz	1 to 400Hz	Set the frequency referenced as acceleration/deceleration time. Set the frequency change time from stop to *Pr. 20* for acceleration/deceleration time.	○	○	○
		21	Acceleration/ deceleration time increments	1	0	0	Increments: 0.1s Range: 0 to 3600s	The increments and setting range of acceleration/ deceleration time setting can be changed.	○	○	○
						1	Increments: 0.01s Range: 0 to 360s				
		44	Second acceleration/ deceleration time	0.1/ 0.01s	5s	0 to 3600/ 360s	Set the acceleration/deceleration time when the RT signal is on.		○	○	○
		45	Second deceleration time	0.1/ 0.01s	9999	0 to 3600/ 360s	Set the deceleration time when the RT signal is on.		○	○	○
						9999	Acceleration time = deceleration time				
		110	Third acceleration/ deceleration time	0.1/ 0.01Hz	9999	0 to 3600/ 360s	Set the acceleration/deceleration time when the X9 signal is on.		○	○	○
						9999	Function invalid				
		111	Third deceleration time	0.1/ 0.01Hz	9999	0 to 3600/ 360s	Set the deceleration time when the X9 signal is on.		○	○	○
						9999	Acceleration time = deceleration time				
Motor protection from overheat (electronic thermal relay function)	9	◎	Electronic thermal O/L relay	0.01/ 0.1A *	Inverter rated current	0 to 500/ 0 to 3600A *	Set the rated motor current. * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)		○	○	○
		51	Second electronic thermal O/L relay	0.01/ 0.1A *	9999	0 to 500/ 0 to 3600A *	Valid when the RT signal is on. Set the rated motor current. * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)		○	○	○
						9999	Second electronic thermal O/L relay invalid				
DC injection brake	10		DC injection brake operation frequency	0.01Hz	3/0.5Hz*	0 to 120Hz	Set the operation frequency of the DC injection brake. * The initial value changes from 3Hz to 0.5Hz when a control mode other than vector is changed to vector control.		○	○	○
						9999	Operate when the output frequency becomes less than or equal to *Pr. 13 Starting frequency*.				
	11		DC injection brake operation time	0.1s	0.5s	0	DC injection brake disabled		○	○	○
						0.1 to 10s	Set the operation time of the DC injection brake.				
						8888	Operated while the X13 signal is on.				
	12		DC injection brake operation voltage	0.1%	4/2/1% *	0	DC injection brake disabled		○	○	○
						0.1 to 30%	Set the DC injection brake voltage (torque). * The initial value differs according to the inverter capacity. (7.5K or lower/11K to 55K/ 75K or higher)				
		802	Pre-excitation selection	1	0	0	Zero speed control	Setting can be made under vector control.	○	○	○
						1	Servo lock				
		850	Brake operation selection	1	0	0	DC injection brake		○	○	○
						1	Zero speed control (under Real sensorless vector control)				
						2	Magnetic flux decay output shutoff (under Real sensorless vector control)				

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Starting frequency	13		Starting frequency	0.01Hz	0.5Hz	0 to 60Hz	Starting frequency can be set.	○	○	○
		571	Holding time at a start	0.1s	9999	0.0 to 10.0s	Set the holding time of *Pr. 13 Starting frequency*.	○	○	○
						9999	Holding function at a start is invalid			
V/F pattern matching applications (V/F)	14		Load pattern selection	1	0	0	For constant-torque load	○	○	○
						1	For variable-torque load			
						2	For constant-torque lift: Boost for reverse rotation 0%			
						3	For constant-torque lift: Boost for forward rotation 0%			
						4	RT signal ON ....For constant-torque load (Same as in setting 0) RT signal OFF ...For constant-torque lift Boost for reverse rotation 0% (Same as in setting 2)			
						5	RT signal ON ....For constant-torque load (Same as in setting 0) RT signal OFF ...For constant-torque lift Boost for forward rotation 0% (Same as in setting 3)			
Jog operation	15		Jog frequency	0.01Hz	5Hz	0 to 400Hz	Set the frequency for jog operation.	○	○	○
	16		Jog acceleration/ deceleration time	0.1/ 0.01s	0.5s	0 to 3600/ 360s	Set the acceleration/deceleration time for jog operation. Set the time taken to reach the frequency set in *Pr. 20 Acceleration/ deceleration reference frequency* for acceleration/deceleration time. (Initial value is 60Hz) In addition, acceleration/deceleration time can not be set separately.	○	○	○
Logic selection of output stop signal (MRS)	17		MRS input selection	1	0	0	Open input always	○	○	○
						2	Normally closed input (NC contact input specifications)			
						4	External terminal:Normally closed input (NC contact input specifications) Communication .:Normally open input			
—	18		Refer to *Pr. 1 and Pr. 2*.							
	19		Refer to *Pr. 3*.							
	20, 21		Refer to *Pr. 7 and Pr. 8*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Stall prevention operation (Magnetic flux, V/F)	22		Stall prevention operation level	0.1%	150%	0	Stall prevention operation selection becomes invalid.	○	○	○
						0.1 to 400%	Function as stall prevention operation under V/F control and Advanced magnetic flux vector control. Set the current value at which stall prevention operation is started. Refer to *page 100* for torque limit level.			
	23		Stall prevention operation level compensation factor at double speed	0.1%	9999	0 to 200%	The stall operation level can be reduced when operating at a high speed above the rated frequency.	○	○	○
						9999	Constant according to *Pr. 22*			
		48	Second stall prevention operation current	0.1%	150%	0	Second stall prevention operation invalid	○	○	○
						0.1 to 220%	The stall prevention operation level can be set.			
		49	Second stall prevention operation frequency	0.01Hz	0Hz	0	Second stall prevention operation invalid	○	○	○
						0.01 to 400Hz	Set the frequency at which stall prevention operation of *Pr. 48* is started.			
						9999	*Pr.48* is valid when the RT signal is on.			
		66	Stall prevention operation reduction starting frequency	0.01Hz	60Hz	0 to 400Hz	Set the frequency at which the stall operation level starts being reduced.	○	○	○
		114	Third stall prevention operation current	0.1%	150%	0	Third stall prevention operation invalid	○	○	○
						0.1 to 220%	The stall prevention operation level can be set.			
		115	Third stall prevention operation frequency	0.01Hz	0	0	Third stall prevention operation invalid	○	○	○
						0.01 to 400Hz	Set the frequency at which stall prevention operation of *Pr. 114* is started.			
		148	Stall prevention level at 0V input	0.1%	150%	0 to 220%	When "4" is set in *Pr. 868* (*Pr. 858*), stall prevention operation level can be changed by the analog signal input to terminal 1 (terminal 4).	○	○	○
		149	Stall prevention level at 10V input	0.1%	200%	0 to 220%		○	○	○
		154	Voltage reduction selection during stall prevention operation	1	1	0	With voltage reduction	○	○	○
						1	Without voltage reduction			
							You can select whether to use output voltage reduction during stall prevention operation or not.			
		156	Stall prevention operation selection	1	0	0 to 31, 100, 101	*Pr. 156* allows you to select whether to use stall prevention or not according to the acceleration/deceleration status.	○	○	○
		157	OL signal output timer	0.1s	0s	0 to 25s	Set the output start time of the OL signal output when stall prevention is activated.	○	○	○
						9999	Without the OL signal output			
		858	Terminal 4 function assignment	Refer to *page 132.*						
		868	Terminal 1 function assignment							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Torque limit level (Vector / Sensorless)	22		Torque limit level	0.1%	150/ 200% *	0 to 400%	This functions as torque limit level under Real sensorless vector control. * For the 3.7K or lower, the initial value changes from 150% to 200% when V/F control or Advanced magnetic flux vector is changed to Real sensorless vector control or vector control. Refer to *page 99* for stall prevention operation level.	○	○	○
		157	OL signal output timer	0.1s	0s	0 to 25s	Set the output start time of the OL signal output when torque limit is activated.	○	○	○
						9999	Without the OL signal output			
		803	Constant power range torque characteristic selection	1	0	0	Constant output limit (torque current limit and control)	○	○	○
						1	Constant torque limit (torque limit and control)			
		810	Torque limit input method selection	1	0	0	Internal torque limit Parameter-set torque limit operation is performed.	○	○	○
						1	External torque limit Torque limit based on the analog input to terminal 1 and 4			
		811	Set resolution switchover	1	0		**Running speed increments** / **Torque limit increments**	○	○	○
						0	1r/min / 0.1% increments			
						1	0.1r/min			
						10	1r/min / 0.01% increments			
						11	0.1r/min			
		812	Torque limit level (regeneration)	0.1%	9999	0 to 400%	Set the torque limit level for forward rotation regeneration.	○	○	○
						9999	Limit at the value of *Pr. 22* or analog terminal			
		813	Torque limit level (3rd quadrant)	0.1%	9999	0 to 400%	Set the torque limit level for reverse rotation driving.	○	○	○
						9999	Limit at the value of *Pr. 22* or analog terminal			
		814	Torque limit level (4th quadrant)	0.1%	9999	0 to 400%	Set the torque limit level for reverse rotation regeneration.	○	○	○
						9999	Limit at the value of *Pr. 22* or analog terminal			
		815	Torque limit level 2	0.1%	9999	0 to 400%	When the torque limit selection (TL) signal is on, the *Pr. 815* value is a torque limit value regardless of *Pr. 810*.	○	○	○
						9999	The torque limit set to.*Pr. 810* is active.			
		816	Torque limit level during acceleration	0.1%	9999	0 to 400%	Set the torque limit value during acceleration.	○	○	○
						9999	Same torque limit as at constant speed			
		817	Torque limit level during deceleration	0.1%	9999	0 to 400%	Set the torque limit value during deceleration.	○	○	○
						9999	Same torque limit as at constant speed			
		874	OLT level setting	0.1%	150%	0 to 200%	This function can make an inverter trip if the torque limit is activated to stall the motor. Set the output torque at which an inverter trip is made in *Pr. 874* .	○	○	○
—	24 to 27		Refer to *Pr. 4 to Pr. 6*.							
Input compensation of multi-speed and remote setting	28		Multi-speed input compensation selection	1	0	0	Without compensation	○	○	○
						1	With compensation			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Acceleration/deceleration pattern and backlash measures	29		Acceleration/ deceleration pattern selection	1	0	0	Linear acceleration/ deceleration	○	○	○
						1	S-pattern acceleration/deceleration A			
						2	S-pattern acceleration/deceleration B			
						3	Backlash measures			
						4	S-pattern acceleration/deceleration C			
						5	S-pattern acceleration/deceleration D			
		140	Backlash acceleration stopping frequency	0.01Hz	1Hz	0 to 400Hz	Set the stopping frequency and time for backlash measures. Valid when *Pr. 29* = "3"	○	○	○
		141	Backlash acceleration stopping time	0.1s	0.5s	0 to 360s		○	○	○
		142	Backlash deceleration stopping frequency	0.01Hz	1Hz	0 to 400Hz		○	○	○
		143	Backlash deceleration stopping time	0.1s	0.5s	0 to 360s		○	○	○
		380	Acceleration S-pattern 1	1%	0%	0 to 50%	Valid when S-pattern acceleration/ deceleration C (*Pr. 29* = 4) is set. Set the time taken for S-pattern from starting of acceleration/deceleration to linear acceleration as % to the acceleration/deceleration time (*Pr. 7*, *Pr. 8*, etc.) An acceleration/deceleration pattern can be changed with the X20 signal.	○	○	○
		381	Deceleration S-pattern 1	1%	0%	0 to 50%		○	○	○
		382	Acceleration S-pattern 2	1%	0%	0 to 50%		○	○	○
		383	Deceleration S-pattern 2	1%	0%	0 to 50%		○	○	○
		516	S-pattern time at a start of acceleration	0.1s	0.1s	0.1 to 2.5s	Valid when S-pattern acceleration/ deceleration D (*Pr. 29* = 5) is set. Set the time taken for S-pattern acceleration/deceleration (S-pattern operation).	○	○	○
		517	S-pattern time at a completion of acceleration	0.1s	0.1s	0.1 to 2.5s		○	○	○
		518	S-pattern time at a start of deceleration	0.1s	0.1s	0.1 to 2.5s		○	○	○
		519	S-pattern time at a completion of deceleration	0.1s	0.1s	0.1 to 2.5s		○	○	○
Selection of regeneration unit	30		Regenerative function selection	1	0	0	Built-in brake, brake unit (FR-BU2 *1, FR-BU, BU)	○	○	○
						1	High-duty brake resistor (FR-ABR), Brake unit (FR-BU2 *2, MT-BU5), Power regeneration converter (MT-RC)			
						2	High power factor converter (FR-HC, MT-HC), Power regeneration common converter (FR-CV)			
						10	Built-in brake unit, brake unit (FR-BU2 *1, FR-BU, BU) — DC feeding mode 1 (operated by DC feeding only)			
						11	High-duty brake resistor (FR-ABR), brake unit (FR-BU2 *2, MT-BU5) — DC feeding mode 1 (operated by DC feeding only)			
						20	Built-in brake unit, brake unit (FR-BU2 *1, FR-BU, BU) — DC feeding mode 2 (operated by switching between AC and DC)			
						21	High-duty brake resistor (FR-ABR), brake unit (FR-BU2 *2, MT-BU5) — DC feeding mode 2 (operated by switching between AC and DC)			
						*1 Used in combination with GZG, GRZG, or FR-BR. *2 Used in combination with MT-BR5.				
		70	Special regenerative brake duty	0.1%	0%	0 to 30/ 0 to 10%*	Set this parameter when a brake unit or power regeneration converter is used. * Range differ according to the inverter capacity. (55K or lower/75K or higher)	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Avoid mechanical resonance points (frequency jump)	31		Frequency jump 1A	0.01Hz	9999	0 to 400Hz, 9999	1A to 1B, 2A to 2B, 3A to 3B is frequency jumps 9999: Function invalid	○	○	○
	32		Frequency jump 1B	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	33		Frequency jump 2A	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	34		Frequency jump 2B	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	35		Frequency jump 3A	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	36		Frequency jump 3B	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
Speed display and speed setting	37		Speed display	1	0	0	Frequency display, setting	○	○	○
						1 to 9998	Set the machine speed for *Pr.505* Set frequency.			
		144	Speed setting switchover	1	4	0, 2, 4, 6, 8, 10, 102, 104, 106, 108, 110	Set the number of motor poles when displaying the motor speed. A setting value is automatically changed depending on the *Pr.81* setting.	○	○	○
		505	Speed setting reference	0.01Hz	60Hz	1 to 120Hz	Set the frequency that will be the basis of machine speed display.	○	○	○
		811	Easy gain tuning response level setting	1	0		**Running speed increments** / **Torque limit increments**	○	○	○
						0	1r/min / 0.1% increments			
						1	0.1r/min			
						10	1r/min / 0.01% increments			
						11	0.1r/min			
Detection of output frequency and motor speed (SU, FU, FU2, FU3, FB, FB2, FB3, LS signal)	41		Up-to-frequency sensitivity	0.1%	10%	0 to 100%	Set the level where the SU signal turns on.	○	○	○
	42		Output frequency detection	0.01Hz	6Hz	0 to 400Hz	Set the frequency where the FU (FB) signal turns on.	○	○	○
	43		Output frequency detection for reverse rotation	0.01Hz	9999	0 to 400Hz	Set the frequency where the FU (FB) signal turns on in reverse rotation.	○	○	○
						9999	Same as *Pr. 42* setting			
		50	Second output frequency detection	0.01Hz	30Hz	0 to 400Hz	Set the frequency where the FU2 (FB2) signal turns on.	○	○	○
		116	Third output frequency detection	0.01Hz	60Hz	0 to 400Hz	Set the frequency where the FU3 (FB3) signal turns on.	○	○	○
		865	Low speed detection	0.01Hz	1.5Hz	0 to 400Hz	Set the frequency where the LS signal turns on.	○	○	○
—	44, 45		Refer to *Pr. 7 and Pr. 8*.							
	46		Refer to *Pr. 0*.							
	47		Refer to *Pr. 3*.							
	48, 49		Refer to *Pr. 22 and Pr. 23*.							
	50		Refer to *Pr. 41 to Pr. 43*.							
	51		Refer to *Pr. 9*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Change of DU/PU monitor descriptions Cumulative monitor clear	52		DU/PU main display data selection	1	0	0, 5 to 14, 17 to 20, 22 to 25, 32 to 35, 39, 46, 50 to 57, 100	Select monitor to be displayed on the operation panel and parameter unit and monitor to be output to the terminal FM and AM. 0 : Output frequency *(Pr. 52)* 1 : Output frequency *(Pr. 54, Pr. 158)* 2 : Output current *(Pr. 54, Pr. 158)* 3 : Output voltage *(Pr. 54, Pr. 158)* 5 : Frequency setting value 6 : Running speed 7 : Motor torque 8 : Converter output voltage 9 : Regenerative brake duty 10 : Electronic thermal relay function load factor 11 : Output current peak value 12 : Converter output voltage peak value 13 : Input power 14 : Output power 17 : Load meter 18 : Motor excitation current 19 : Position pulse *1 *(Pr. 52)* 20 : Cumulative energization time *(Pr. 52)* 21 : Reference voltage output *(Pr. 54, Pr. 158)* 22 : Orientation status *1 *(Pr. 52)* 23 : Actual operation time *(Pr. 52)* 24 : Motor load factor 25 : Cumulative power *(Pr. 52)* 32 : Torque command 33 : Torque current command 34 : Motor output 35 : Feedback pulse *1 *(Pr. 52)* 39 : SSCNET III communication status *2 46 : Motor temperature *3 50 : Power saving effect 51 : Cumulative saving power *(Pr. 52)* 52 : PID set point 53 : PID measured value 54 : PID deviation (*Pr. 52*) 55 : Input/output terminal status *(Pr. 52)* 56 : Option input terminal status *(Pr. 52)* 57 : Option output terminal status *(Pr. 52)* 100 : Set frequency is displayed during a stop and output frequency is displayed during operation *(Pr. 52)* *1 Available only when FR-A7AP/FR-A7AL is mounted. *2 Available only when FR-A7NS is mounted. *3 Available only when FR-A7AZ is mounted and SFV5RU□□□□□T/A is used.	○	○	○
	54		FM terminal function selection	1	1	1 to 3, 5 to 14, 17, 18, 21, 24, 32 to 34, 46, 50, 52, 53		○	○	○
		158	AM terminal function selection	1	1	1 to 3, 5 to 14, 17, 18, 21, 24, 32 to 34, 46, 50, 52, 53		○	○	○
		170	Watt-hour meter clear	1	9999	0	Set "0" to clear the watt-hour meter monitor.	○	×	○
						10	Sets the maximum value for the monitoring from communication to 9999kWh.			
						9999	Sets the maximum value for the monitoring from communication to 65535kWh.			
		171	Operation hour meter clear	1	9999	0, 9999	Set "0" to clear the operation time monitor. Setting "9999" has no effect.	×	×	×
		268	Monitor decimal digits selection	1	9999	0	Displays the monitor as integral value.	○	○	○
						1	Displays the monitor in increments of 0.1.			
						9999	No fixed decimal position			
		563	Energization time carrying-over times	1	0	(0 to 65535)	The numbers of cumulative energization time monitor exceeded 65535h is displayed. Reading only	×	×	×
		564	Operating time carrying-over times	1	0	(0 to 65535)	The numbers of operation time monitor exceeded 65535h is displayed. Reading only	×	×	×
		867	AM output filter	0.01s	0.01s	0 to 5s	Set the output filter of terminal AM.	○	○	○
		891	Cumulative power monitor digit shifted times	1	9999	0 to 4	Set the number of times to shift the cumulative power monitor digit. Clamps the monitor value at maximum.	○	○	○
						9999	No shift Clears the monitor value when it exceeds the maximum value.			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Change of the monitor output from terminal FM and AM	55		Frequency monitoring reference	0.01Hz	60Hz	0 to 400Hz	Set the full-scale value to output the output frequency monitor value to terminal FM and AM.	○	○	○
	56		Current monitoring reference	0.01/ 0.1A *	Inverter rated current	0 to 500/ 0 to 3600A *	Set the full-scale value to output the output current monitor value to terminal FM and AM. * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	○	○
		866	Torque monitoring reference	0.1%	150%	0 to 400%	Set the full-scale value to output the torque monitor value to terminal FM and AM.	○	○	○
Restart operation after instantaneous power failure	57		Restart coasting time	0.1s	9999	0	The coasting time is as follows: 1.5K or lower..... 0.5s, 2.2K to 7.5K ..... 1.0s, 11K to 55K ..... 3.0s, 75K or higher 5.0s	○	○	○
						0.1 to 5s/ 0.1 to 30s *	Set the waiting time for inverter-triggered restart after an instantaneous power failure. * The setting range differs according to the inverter capacity (55K or lower/75k or higher)			
						9999	No restart			
	58		Restart cushion time	0.1s	1s	0 to 60s	Set a voltage starting time at restart.	○	○	○
		162	Automatic restart after instantaneous power failure selection	1	0	0	With frequency search	○	○	○
						1	Without frequency search (Reduced voltage system)			
						2	Encoder detection frequency			
						10	Frequency search at every start			
						11	Reduced voltage at every start			
						12	Encoder detection frequency at every start			
		163	First cushion time for restart	0.1s	0s	0 to 20s	Set a voltage starting time at restart. Consider according to the magnitude of load (inertia moment/torque).	○	○	○
		164	First cushion voltage for restart	0.1%	0%	0 to 100%		○	○	○
		165	Stall prevention operation level for restart	0.1%	150%	0 to 220%	Consider the rated inverter current as 100% and set the stall prevention operation level during restart operation.	○	○	○
		299	Rotation direction detection selection at restarting	1	0	0	Without rotation direction detection	○	○	○
						1	With rotation direction detection			
						9999	When *Pr. 78* = "0", the rotation direction is detected. When *Pr. 78* = "1", "2", the rotation direction is not detected.			
		611	Acceleration time at a restart	0.1s	5/15s *	0 to 3600s	Set the acceleration time to reach *Pr.20 Acceleration/ deceleration reference frequency* at a restart. * The initial value differs according to the inverter capacity. (55K or lower/75k or higher)	○	○	○
						9999	Acceleration time for restart is the normal acceleration time (e.g. *Pr. 7*).			
Remote setting function	59		Remote function selection	1	0		**RH, RM, RL signal function** / **Frequency setting storage function**	○	○	○
						0	Multi-speed setting / —			
						1	Remote setting / Yes			
						2	Remote setting / No			
						3	Remote setting / No (Turning STF/STR off clears remotely-set frequency.)			
Energy saving control selection V/F	60		Energy saving control selection	1	0	0	Normal operation mode	○	○	○
						4	Energy saving operation mode			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
Automatic acceleration/deceleration	61		Reference current	0.01/ 0.1A*	9999	0 to 500/ 0 to 3600A*	Setting value (rated motor current) is referenced * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)		○	○	○
						9999	Rated inverter current is referenced				
	62		Reference value at acceleration	0.1%	9999	0 to 220%	Setting value is a limit value	Shortest acceleration/ deceleration mode	○	○	○
							Setting value is an optimum value	Optimum acceleration/ deceleration mode			
						9999	150% is a limit value	Shortest acceleration/ deceleration mode			
							100% is an optimum value	Optimum acceleration/ deceleration mode			
	63		Reference value at deceleration	0.1%	9999	0 to 220%	Setting value is a limit value	Shortest acceleration/ deceleration mode	○	○	○
							Setting value is an optimum value	Optimum acceleration/ deceleration mode			
						9999	150% is a limit value	Shortest acceleration/ deceleration mode			
							100% is an optimum value	Optimum acceleration/ deceleration mode			
	64		Starting frequency for elevator mode	0.01Hz	9999	0 to 10Hz	0 to 10Hz are starting frequency		○	○	○
						9999	2Hz is starting frequency				
		292	Automatic acceleration/ deceleration	1	0	0	Normal mode		○	○	○
						1	Shortest acceleration/ deceleration mode	Without brake			
						11		With brake			
						3	Optimum acceleration/deceleration mode				
						5	Elevator mode 1				
						6	Elevator mode 2				
						7	Brake sequence mode 1				
						8	Brake sequence mode 2				
		293	Acceleration/ deceleration separate selection	1	0	0	Calculate acceleration/deceleration time of both acceleration and deceleration for the shortest and optimum acceleration/ deceleration mode.		○	○	○
						1	Calculate only acceleration time for the shortest and optimum acceleration/ deceleration mode				
						2	Calculate only deceleration time for the shortest and optimum acceleration/ deceleration mode				
Retry function at alarm occurrence	65		Retry selection	1	0	0 to 5	A fault for retry can be selected.		○	○	○
		67	Number of retries at fault occurrence	1	0	0	No retry function		○	○	○
						1 to 10	Set the number of retries at fault occurrence. A fault output is not provided during retry operation.				
						101 to 110	Set the number of retries at fault occurrence. (The setting value minus 100 is the number of retries.) A fault output is provided during retry operation.				
		68	Retry waiting time	0.1s	1s	0 to 10s	Set the waiting time from when an inverter fault occurs until a retry is made.		○	○	○
		69	Retry count display erase	1	0	0	Clear the number of restarts succeeded by retry.		○	○	○
—	66		Refer to *Pr. 22 and Pr. 23*.								
	67 to 69		Refer to *Pr. 65*.								
	70		Refer to *Pr. 30*.								

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
Motor selection (applied motor)	71		Applied motor	1	0	0	Thermal characteristics of a standard motor		○	○	○
						1	Thermal characteristics of the Mitsubishi constant-torque motor				
						2	Thermal characteristic of standard motor Adjustable 5 points V/F				
						20	Mitsubishi standard motor (SF-JR 4P 1.5kW or less)				
						30	Thermal characteristics of the Mitsubishi vector motor SF-V5RU (1500r/min series)				
						40	Thermal characteristic of Mitsubishi high efficiency motor (SF-HR)				
						50	Thermal characteristic of Mitsubishi constant-torque motor (SF-HRCA)				
						3	Standard motor	Select "offline auto tuning setting"			
						13	Constant-torque motor Mitsubishi vector motor SF-V5RU (except for 1500 r/min series)				
						23	Mitsubishi standard motor (SF-JR 4P 1.5kW or less)				
						33	Mitsubishi vector motor SF-V5RU (1500r/min series), SF-THY				
						43	Mitsubishi high efficiency motor (SF-HR)				
						53	Mitsubishi constant-torque motor (SF-HRCA)				
						4	Standard motor	Auto tuning data can be read, changed, and set.			
						14	Constant-torque motor Mitsubishi vector motor SF-V5RU (except for 1500 r/min series)				
						24	Mitsubishi standard motor (SF-JR 4P 1.5kW or less)				
						34	Mitsubishi vector motor SF-V5RU (1500r/min series), SF-THY				
						44	Mitsubishi high efficiency motor (SF-HR)				
						54	Mitsubishi constant-torque motor (SF-HRCA)				
						5	Standard motor	Star connection Direct input of motor constants is enabled			
						15	Constant-torque motor				
						6	Standard motor	Delta connection Direct input of motor constants is enabled			
						16	Constant-torque motor				
						7	Standard motor	Star connection Motor constants direct input + Offline auto tuning			
						17	Constant-torque motor				
						8	Standard motor	Delta connection Motor constants direct input + Offline auto tuning			
						18	Constant-torque motor				
		450	Second applied motor	1	9999	0 to 8, 13 to 18, 20, 23, 24, 30, 33, 34, 40, 43, 44, 50, 53, 54	Set when using the second motor. (same specifications as *Pr. 71*)		○	○	○
						9999	Second motor is invalid				

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Carrier frequency and SoftPWM selection	72		PWM frequency selection	1	2	0 to 15/ 0 to 6, 25 *	PWM carrier frequency can be changed. The setting displayed is in [kHz]. Note that 0 indicates 0.7kHz, 15 indicates 14.5kHz, 25 indicates 2.5. (25 is exclusively for a sine wave filter.) The following settings are for Real sensorless vector control and vector control. 0 to 5: 2kHz, 6 to 9: 6kHz, 10 to 13: 10kHz, 14 to 15: 14kHz * The setting range differs according to the inverter capacity. (55K or lower/75k or higher)	○	○	○
		240	Soft-PWM operation selection	1	1	0	Soft-PWM invalid	○	○	○
						1	When *Pr. 72* = "0 to 5" ("0 to 4" for the 75K or higher), Soft-PWM is valid.			
Analog input selection	73		Analog input selection	1	1	0 to 7, 10 to 17	You can select the input specifications of terminal 2 (0 to 5V, 0 to 10V, 0 to 20mA) and input specifications of terminal 1 (0 to ±5V, 0 to ±10V). To change the terminal 2 to the voltage input specification (0 to 5V/ 0 to 10V), turn OFF (initial status) the voltage/current input switch 2. To change it to the current input (0 to 20mA), turn ON the voltage/ current input switch 2. Override and reversible operation can be selected.	○	×	○
		242	Terminal 1 added compensation amount (terminal 2)	0.1%	100%	0 to 100%	Set the ratio of added compensation amount when terminal 2 is the main speed.	○	○	○
		243	Terminal 1 added compensation amount (terminal 4)	0.1%	75%	0 to 100%	Set the ratio of added compensation amount when terminal 4 is the main speed.	○	○	○
		252	Override bias	0.1%	50%	0 to 200%	Set the bias side compensation value of override function.	○	○	○
		253	Override gain	0.1%	150%	0 to 200%	Set the gain side compensation value of override function.	○	○	○
		267	Terminal 4 input selection	1	0	0	Terminal 4 input 4 to 20mA / Turn ON the voltage/current input switch 1(initial status).	○	×	○
						1	Terminal 4 input 0 to 5V / Turn OFF the voltage/current input switch 1.			
						2	Terminal 4 input 0 to 10V			
Response level of analog input and noise elimination	74		Input filter time constant	1	1	0 to 8	The primary delay filter time constant for the analog input can be set. A larger setting results in slower response.	○	○	○
		822	Speed setting filter 1	0.001s	9999	0 to 5s, 9999	Set the time constant of the primary delay filter relative to the external speed command (analog input command).	○	○	○
		826	Torque setting filter 1	0.001s	9999	0 to 5s, 9999	Set the time constant of the primary delay filter relative to the external torque command (analog input command).	○	○	○
		832	Speed setting filter 2	0.001s	9999	0 to 5s, 9999	Second function of *Pr. 822* (valid when the RT terminal is on)	○	○	○
		836	Torque setting filter 2	0.001s	9999	0 to 5s, 9999	Second function of *Pr. 826* (valid when the RT terminal is on)	○	○	○
		849	Analog input offset adjustment	0.1%	100%	0 to 200%	This function provides speed command by analog input (terminal 2) with offset and avoids frequency command to be given due to noise under 0 speed command.	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Reset selection, disconnected PU detection	75		Reset selection/ disconnected PU detection/PU stop selection	1	14	0 to 3, 14 to 17	You can select the reset input acceptance, disconnected PU (FR-DU07/FR-PU07/FR-PU04) connector detection function and PU stop function. For the initial value, reset always enabled, without disconnected PU detection, and with PU stop function are set.	○	×	×
Output function of alarm code	76		Fault code output selection	1	0	0	Without fault code output	○	○	○
						1	With fault code output			
						2	Fault code output at fault occurrence only			
Prevention of parameter rewrite	77		Parameter write selection	1	0	0	Write is enabled only during a stop	○	○	○
						1	Parameter write is disabled.			
						2	Parameter write is enabled in any operation mode regardless of operating status.			
Prevention of reverse rotation of the motor	78		Reverse rotation prevention selection	1	0	0	Both forward and reverse rotations allowed	○	○	○
						1	Reverse rotation disallowed			
						2	Forward rotation disallowed			
Operation mode selection	79	◎	Operation mode selection	1	0	0	External/PU switchover mode	○	○	○
						1	Fixed to PU operation mode			
						2	Fixed to External operation mode			
						3	External/PU combined operation mode 1			
						4	External/PU combined operation mode 2			
						6	Switchover mode			
						7	External operation mode (PU operation interlock)			
		340	Communication startup mode selection	1	0	0	As set in *Pr. 79*.	○	○*	○*
						1, 2	Started in the Network operation mode. When the setting is "2", it will resume the pre-instantaneous power failure operation mode after an instantaneous power failure occurs.			
						10, 12	Started in the Network operation mode. Operation mode can be changed between the PU operation mode and Network operation mode from the operation panel. When the setting is "12", it will resume the pre-instantaneous power failure operation mode after an instantaneous power failure occurs.			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Selection of control method (Vector / Sensorless / Magnetic flux)	80		Motor capacity	0.01/0.1kW *	9999	0.4 to 55/0 to 3600kW *	Set the applied motor capacity. * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	○	○
						9999	V/F control is performed			
	81		Number of motor poles	1	9999	2, 4, 6, 8, 10	Set the number of motor poles.	○	○	○
						12, 14, 16, 18, 20	X18 signal-ON:V/F control / Set 10 + number of motor poles.			
						9999	V/F control is performed			
		89	Speed control gain (Advanced magnetic flux vector)	0.1%	9999	0 to 200%	Motor speed fluctuation due to load fluctuation is adjusted during Advanced magnetic flux vector control. 100% is a referenced value.	○	×	○
						9999	Gain matching with the motor set in *Pr.71*.			
		451	Second motor control method selection	1	9999	10, 11, 12	Select the method of controlling the second motor. (same as *Pr.800*)	○	○	○
						20, 9999	V/F Control (Advanced magnetic flux vector control)			
		453	Second motor capacity	0.01/0.1kW *	9999	0.4 to 55/0 to 3600kW *	Set the capacity of the second motor. * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	○	○
						9999	V/F control is performed			
		454	Number of second motor poles	1	9999	2, 4, 6, 8, 10	Set the number of poles of the second motor.	○	○	○
						9999	V/F control is performed			
		569	Second motor speed control gain	0.1%	9999	0 to 200%	Second motor speed fluctuation due to load fluctuation is adjusted during Advanced magnetic flux vector control. 100% is a referenced value.	○	×	○
						9999	Gain matching with the motor set in *Pr.450*.			
		800	Control method selection	1	20	0	Speed control / Vector control (FR-A7AP/FR-A7AL)	○	○	○
						1	Torque control / Vector control (FR-A7AP/FR-A7AL)			
						2	MC signal-ON:torque MC signal-OFF:speed / Vector control (FR-A7AP/FR-A7AL)			
						3	Position control / Vector control (FR-A7AP/FR-A7AL)			
						4	MC signal-ON:position MC signal-OFF:speed / Vector control (FR-A7AP/FR-A7AL)			
						5	MC signal-ON:torque MC signal-OFF:position / Vector control (FR-A7AP/FR-A7AL)			
						9	Vector control test operation Test operation of vector control (speed control) can be performed without connecting a motor.			
						10	Speed control / Real sensorless vector control			
						11	Torque control / Real sensorless vector control			
						12	MC signal-ON : Torque MC signal-OFF : Speed / Real sensorless vector control			
						20	V/F Control (Advanced magnetic flux vector control)			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Offline auto tuning (Vector / Sensorless / Magnetic flux)	82		Motor excitation current	0.01/ 0.1A *	9999	0 to 500/ 0 to 3600A *	Tuning data (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
	83		Rated motor voltage	0.1V	200/ 400V *	0 to 1000V	Set the rated motor voltage(V). * The initial values differ according to the voltage level. (200V/400V)	○	○	○
	84		Rated motor frequency	0.01Hz	60Hz	10 to 120Hz	Set the rated motor frequency (Hz).	○	○	○
		90	Motor constant (R1)	0.001Ω/ 0.01mΩ *	9999	0 to 50Ω/ 0 to 400mΩ *	Tuning data (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		91	Motor constant (R2)	0.001Ω/ 0.01mΩ *	9999	0 to 50Ω/ 0 to 400mΩ *	Tuning data (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		92	Motor constant (L1)	0.001Ω (0.1mH) /0.01mΩ (0.01mH) *	9999	0 to 50Ω (0 to 1000mH)/ 0 to 3600mΩ (0 to 400mH) *	Tuning data (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		93	Motor constant (L2)	0.001Ω (0.1mH) /0.01mΩ (0.01mH) *	9999	0 to 50Ω (0 to 1000mH)/ 0 to 3600mΩ (0 to 400mH) *	Tuning data (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		94	Motor constant (X)	0.01Ω (0.1%)/ 0.01Ω (0.01%) *	9999	0 to 500Ω (0 to 100%)/ 0 to 100Ω (0 to 100%) *	Tuning data (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		96	Auto tuning setting/ status	1	0	0	Auto tuning is not performed	○	×	○
						1	Tuning performed without motor running			
						101	Tuning performed with motor running			
		455	Second motor excitation current	0.01/ 0.1A *	9999	0 to 500/ 0 to 3600A *	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		456	Rated second motor voltage	0.1V	200/ 400V *	0 to 1000V	Set the rated voltage (V) of the second motor. * The initial values differ according to the voltage level. (200V/400V)	○	○	○
		457	Rated second motor frequency	0.01Hz	60Hz	10 to 120Hz	Set the rated frequency (Hz) of the second motor.	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Offline auto tuning Vector Sensorless Magnetic flux		*458*	Second motor constant (R1)	0.001Ω/ 0.01mΩ *	9999	0 to 50Ω/ 0 to 400mΩ *	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		459	Second motor constant (R2)	0.001Ω/ 0.01mΩ *	9999	0 to 50Ω/ 0 to 400mΩ *	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		460	Second motor constant (L1)	0.001Ω (0.1mH)/ 0.01mΩ (0.01mH) *	9999	0 to 50Ω (0 to 1000mH)/ 0 to 3600mΩ (0 to 400mH) *	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		461	Second motor constant (L2)	0.001Ω (0.1mH) /0.01mΩ (0.01mH) *	9999	0 to 50Ω (0 to 1000mH)/ 0 to 3600mΩ (0 to 400mH) *	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		462	Second motor constant (X)	0.01Ω (0.1%)/ 0.01mΩ (0.01%) *	9999	0 to 500Ω (0 to 100%)/ 0 to 100Ω (0 to 100%) *	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		463	Second motor auto tuning setting/status	1	0	0, 1, 101	Set the tuning mode of the second motor. (same as *Pr. 96*)	○	×	○
		684	Tuning data unit switchover	1	0	0	Internal data converter value	○	○	○
						1	Displayed in "A, Ω, mH, %".			
		859	Torque current	0.01/ 0.1A *	9999	0 to 500/ 0 to 3600A *	Tuning data (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
		860	Second motor torque current	0.01/ 0.1A *	9999	0 to 500/ 0 to 3600A *	Tuning data of the second motor (The value measured by offline auto tuning is automatically set.) * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
						9999	Use the Mitsubishi motor (SF-JR, SF-HRCA, etc.) constants			
—	89		Refer to *Pr. 81*.							
	90 to 94		Refer to *Pr. 82* to *Pr. 84*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Online auto tuning Vector Sensorless Magnetic flux	95		Online auto tuning selection	1	0	0	Online auto tuning is not performed	○	○	○
						1	Start-time tuning (at start-up)			
						2	Magnetic flux observer (normal)			
		574	Second motor online auto tuning	1	0	0, 1	Select the second motor online auto tuning. (same as *Pr. 95*)	○	○	○
—	96		Refer to *Pr. 82* to *Pr. 84*.							
Adjustable 5 points V/F V/F	100		V/F1(first frequency)	0.01Hz	9999	0 to 400Hz, 9999	Set each points (frequency, voltage) of V/F pattern. 9999: No V/F setting	○	○	○
	101		V/F1(first frequency voltage)	0.1V	0V	0 to 1000V		○	○	○
	102		V/F2(second frequency)	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	103		V/F2(second frequency voltage)	0.1V	0V	0 to 1000V		○	○	○
	104		V/F3(third frequency)	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	105		V/F3(third frequency voltage)	0.1V	0V	0 to 1000V		○	○	○
	106		V/F4(fourth frequency)	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	107		V/F4(fourth frequency voltage)	0.1V	0V	0 to 1000V		○	○	○
	108		V/F5(fifth frequency)	0.01Hz	9999	0 to 400Hz, 9999		○	○	○
	109		V/F5(fifth frequency voltage)	0.1V	0V	0 to 1000V		○	○	○
		71	Refer to *page 106*.							
—	110, 111		Refer to *Pr. 7*.							
	112		Refer to *Pr. 0*.							
	113		Refer to *Pr. 3*.							
	114, 115		Refer to *Pr. 22*.							
	116		Refer to *Pr. 41*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
PU connector communication	117		PU communication station number	1	0	0 to 31	Specify the inverter station number. Set the inverter station numbers when two or more inverters are connected to one personal computer.	○	○*	○*
	118		PU communication speed	1	192	48, 96, 192, 384	Set the communication speed. The setting value × 100 equals the communication speed. For example, the communication speed is 19200bps when the setting value is "192".	○	○*	○*
	119		PU communication stop bit length	1	1	0	Stop bit length: 1bit data length: 8bit	○	○*	○*
						1	Stop bit length: 2bit data length: 8bit			
						10	Stop bit length: 1bit data length: 7bit			
						11	Stop bit length: 2bit data length: 7bit			
	120		PU communication parity check	1	2	0	Without parity check	○	○*	○*
						1	With odd parity check			
						2	With even parity check			
	121		Number of PU communication retries	1	1	0 to 10	Set the permissible number of retries at occurrence of a data receive error. If the number of consecutive errors exceeds the permissible value, the inverter trips.	○	○*	○*
						9999	If a communication error occurs, the inverter will not trip.			
	122		PU communication check time interval	0.1s	9999	0	No PU connector communication	○	○*	○*
						0.1 to 999.8s	Set the communication check time interval. If a no-communication state persists for longer than the permissible time, the inverter trips.			
						9999	No communication check (signal loss detection)			
	123		PU communication waiting time setting	1	9999	0 to 150ms	Set the waiting time between data transmission to the inverter and response.	○	○*	○*
						9999	Set with communication data.			
	124		PU communication CR/LF selection	1	1	0	Without CR/LF	○	○*	○*
						1	With CR			
						2	With CR/LF			
		342	Communication EEPROM write selection	1	0	0	Parameter values written by communication are written to the EEPROM and RAM.	○	○	○
						1	Parameter values written by communication are written to the RAM.			
		551	PU mode operation command source selection	1	2	1	Select the RS-485 terminals as the PU operation mode control source.	○	○*	○*
						2	Select the PU connector as the PU operation mode control source.			
						3	Select the USB connector as the PU operation mode control source.			
Change of analog input frequency, adjustment of voltage, current input and frequency (calibration)	125 ◎		Terminal 2 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Set the frequency of terminal 2 input gain (maximum).	○	×	○
	126 ◎		Terminal 4 frequency setting gain frequency	0.01Hz	60Hz	0 to 400Hz	Set the frequency of terminal 4 input gain (maximum). (Valid when *Pr. 858* = 0 (initial value))	○	×	○
		241	Analog input display unit switchover	1	0	0	Displayed in %	Select the unit for analog input display.	○	○	○
						1	Displayed in V/mA			
		C2 (902)	Terminal 2 frequency setting bias frequency	0.01Hz	0Hz	0 to 400Hz	Set the frequency on the bias side of terminal 2 input.		○	×	○
		C3 (902)	Terminal 2 frequency setting bias	0.1%	0%	0 to 300%	Set the converted % of the bias side voltage (current) of terminal 2 input.		○	×	○
		C4 (903)	Terminal 2 frequency setting gain	0.1%	100%	0 to 300%	Set the converted % of the gain side voltage of terminal 2 input.		○	×	○
		C5 (904)	Terminal 4 frequency setting bias frequency	0.01Hz	0Hz	0 to 400Hz	Set the frequency on the bias side of terminal 4 input. (Valid when *Pr. 858* = 0 (initial value))		○	×	○
		C6 (904)	Terminal 4 frequency setting bias	0.1%	20%	0 to 300%	Set the converted % of the bias side current (voltage) of terminal 4 input. (Valid when *Pr. 858* = 0 (initial value))		○	×	○
		C7 (905)	Terminal 4 frequency setting gain	0.1%	100%	0 to 300%	Set the converted % of the gain side current (voltage) of terminal 4 input. (Valid when *Pr. 858* = 0 (initial value))		○	×	○

The parameter number in parentheses is the one for use with the parameter unit (FR-PU04/FR-PU07).

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
PID control	127		PID control automatic switchover frequency	0.01Hz	9999	0 to 400Hz	Set the frequency at which the control is automatically changed to PID control.	○	○	○
						9999	Without PID automatic switchover function			
	128		PID action selection	1	10	10	PID reverse action — Deviation value signal (terminal 1)	○	○	○
						11	PID forward action — Deviation value signal (terminal 1)			
						20	PID reverse action — Measured value input (terminal 4)			
						21	PID forward action — Measured value input (terminal 4)			
						50	PID reverse action — Deviation value signal input (LONWORKS, CC-Link communication)			
						51	PID forward action — Deviation value signal input (LONWORKS, CC-Link communication)			
						60	PID reverse action — Measured value, set value input (LONWORKS, CC-Link communication)			
						61	PID forward action — Measured value, set value input (LONWORKS, CC-Link communication)			
	129		PID proportional band	0.1%	100%	0.1 to 1000%	If the proportional band is narrow (parameter setting is small), the manipulated variable varies greatly with a slight change of the measured value. Hence, as the proportional band narrows, the response sensitivity (gain) improves but the stability deteriorates, e.g. hunting occurs. Gain K = 1/proportional band	○	○	○
						9999	No proportional control			
	130		PID integral time	0.1s	1s	0.1 to 3600s	When deviation step is input, time (Ti) is the time required for integral (I) action to provide the same manipulated variable as the proportional (P) action. As the integral time decreases, the set point is reached earlier but hunting occurs more easily.	○	○	○
						9999	No integral control.			
	131		PID upper limit	0.1%	9999	0 to 100%	Set the upper limit value. If the feedback value exceeds the setting, the FUP signal is output. The maximum input (20mA/5V/10V) of the measured value (terminal 4) is equivalent to 100%.	○	○	○
						9999	No function			
	132		PID lower limit	0.1%	9999	0 to 100%	Set the lower limit value. If the measured value falls below the setting range, the FDN signal is output. The maximum input (20mA/5V/10V) of the measured value (terminal 4) is equivalent to 100%.	○	○	○
						9999	No function			
	133		PID action set point	0.01%	9999	0 to 100%	Used to set the set point for PID control.	○	○	○
						9999	Terminal 2 input voltage is the set point.			
	134		PID differential time	0.01s	9999	0.01 to 10.00s	For deviation lamp input, time (Td) required for providing only the manipulated variable for the proportional (P) action. As the differential time increases, greater response is made to a deviation change.	○	○	○
						9999	No differential control.			
		575	Output interruption detection time	0.1s	1s	0 to 3600s	If the output frequency after PID operation remains lower than the *Pr. 576* setting for longer than the time set in *Pr. 575*, the inverter stops operation.	○	○	○
						9999	Without output interruption function			
		576	Output interruption detection level	0.01Hz	0Hz	0 to 400Hz	Set the frequency at which the output interruption processing is performed.	○	○	○
		577	Output interruption cancel level	0.1%	1000%	900 to 1100%	Set the level (*Pr. 577* minus 1000%) to release the PID output interruption function.	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Switch between the inverter operation and bypass operation to use	135		Electronic bypass sequence selection	1	0	0	Without electronic bypass sequence	○	○	○
						1	With electronic bypass sequence			
	136		MC switchover interlock time	0.1s	1s	0 to 100s	Set the operation interlock time of MC2 and MC3.	○	○	○
	137		Start waiting time	0.1s	0.5s	0 to 100s	Set the time slightly longer (0.3 to 0.5s or so) than the time from when the ON signal enters MC3 until it actually turns on.	○	○	○
	138		Bypass selection at a fault	1	0	0	Inverter output is stopped (motor coast) at inverter fault.	○	○	○
						1	Operation is automatically switched to bypass operation at inverter fault (Not switched when an external thermal relay operation (E.OHT) or CPU fault (E.CPU) occurs)			
	139		Automatic switchover frequency from inverter to bypass operation	0.01Hz	9999	0 to 60Hz	Set the frequency to switch inverter operation to bypass operation.	○	○	○
						9999	Without automatic switchover			
		159	Automatic switchover frequency range from bypass to inverter operation	0.01Hz	9999	0 to 10Hz	Valid during automatic switchover operation (*Pr. 139* ≠ 9999) When the frequency command decreases below (*Pr. 139* - *Pr. 159*) after operation is switched from inverter operation to bypass operation, the inverter automatically switches operation to inverter operation and operates at the frequency of frequency command. When the inverter start command (STF/STR) is turned off, operation is switched to inverter operation also.	○	○	○
						9999	Valid during automatic switchover operation (*Pr. 139* ≠ 9999) When the inverter start command (STF/STR) is turned off after operation is switched from inverter operation to bypass operation, operation is switched to inverter operation and the motor decelerates to stop.			
—	140 to 143		Refer to *Pr. 29*.							
	144		Refer to *Pr. 37*.							
Parameter unit language switchover	145		PU display language selection	1	0	0	Japanese	○	×	×
						1	English			
						2	Germany			
						3	French			
						4	Spanish			
						5	Italian			
						6	Swedish			
						7	Finnish			
—	148,149		Refer to *Pr. 22*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Detection of output current (Y12 signal) Detection of zero current (Y13 signal)	150		Output current detection level	0.1%	150%	0 to 220%	Set the output current detection level. 100% is the rated inverter current.	○	○	○
	151		Output current detection signal delay time	0.1s	0s	0 to 10s	Set the output current detection period. Set the time from when the output current has risen above the setting until the output current detection signal (Y12) is output.	○	○	○
	152		Zero current detection level	0.1%	5%	0 to 220%	Set the zero current detection level. Suppose that the rated inverter current is 100%.	○	○	○
	153		Zero current detection time	0.01s	0.5s	0 to 1s	Set this parameter to define the period from when the output current drops below the *Pr. 152* value until the zero current detection signal (Y13) is output.	○	○	○
		166	Output current detection signal retention time	0.1s	0.1s	0 to 10s	Set the retention time when the Y12 signal is on.	○	○	○
						9999	The Y12 signal on status is retained. The signal is turned off at the next start.			
		167	Output current detection operation selection	1	0	0	Operation continues when the Y12 signal is on	○	○	○
						1	The inverter trips when the Y12 signal is on. (E.CDO)			
—	154		Refer to *Pr. 22*.							
Condition selection of function validity by the second function selection signal (RT) and third function(X9)	155		RT signal function validity condition selection	1	0	0	Second (third) function is immediately valid with ON of the RT (X9) signal.	○	○	○
						10	Second (third) function is valid only during the RT (X9) signal is on and constant speed operation. (invalid during acceleration/deceleration)			
—	156, 157		Refer to *Pr. 22* .							
	158		Refer to *Pr. 54* .							
	159		Refer to *Pr. 135* .							
User group function	160	◎	User group read selection	1	0	0	All parameters can be displayed.	○	○	○
						1	Only the parameters registered in the user group can be displayed.			
						9999	Only the simple mode parameters can be displayed.			
		172	User group registered display/ batch clear	1	0	(0 to 16)	Displays the number of cases registered as a user group (reading only).	○	×	×
						9999	Batch clear the user group registration			
		173	User group registration	1	9999	0 to 999, 9999	Set the parameter numbers to be registered to the user group. Read value is always "9999".	×	×	×
		174	User group clear	1	9999	0 to 999, 9999	Set the parameter numbers to be cleared from the user group. Read value is always "9999".	×	×	×
Operation selection of the operation panel	161		Frequency setting/ key lock operation selection	1	0	0	Setting dial frequency setting mode — Key lock invalid	○	×	○
						1	Setting dial potentiometer mode — Key lock invalid			
						10	Setting dial frequency setting mode — Key lock valid			
						11	Setting dial potentiometer mode — Key lock valid			
—	162 to 165		Refer to *Pr. 57*.							
	166, 167		Refer to *Pr. 150*.							
	168, 169		Parameter for manufacturer setting. Do not set.							
	170, 171		Refer to *Pr. 52*.							
	172 to 174		Refer to *Pr. 160*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Function assignment of input terminal	178		STF terminal function selection	1	60	0 to 20, 22 to 28, 42 to 44, 60, 62, 64 to 71, 74, 9999	0: Low-speed operation command (RL) 1: Middle-speed operation command (RM) 2: High-speed operation command (RH) 3: Second function selection (RT) 4: Terminal 4 input selection (AU) 5: Jog operation selection (JOG) 6: Selection of automatic restart after instantaneous power failure, flying start (CS) 7: External thermal relay input (OH) 8: 15-speed selection (REX) 9: Third function (X9) 10: Inverter run enable signal (FR-HC/MT-HC, FR-CV connection) (X10) 11: FR-HC/MT-HC connection, instantaneous power failure detection (X11) 12: PU operation external interlock (X12) 13: External DC injection brake start (X13) 14: PID control valid terminal (X14) 15: Brake opening completion signal (BRI) 16: PU/External operation switchover (X16) 17: Load pattern selection forward/reverse rotation boost (X17) 18: V/F switchover (X18) 19: Load torque high-speed frequency (X19) 20: S-pattern acceleration/deceleration C switching terminal (X20) 22: Orientation command (X22) *1 23: Pre-excitation (LX) 24: Output stop (MRS) 25: Start self-holding selection (STOP) 26: Control mode changing (MC) 27: Torque limit selection (TL) 28: Start time tuning (X28) 42: Torque bias selection 1 (X42) *1 43: Torque bias selection 2 (X43) *1 44: P/PI control switchover (X44) 60: Forward rotation command (STF) (assigned to STF terminal (*Pr. 178*) only) 61: Reverse rotation command (STR) (assigned to STR terminal (*Pr. 179*) only) 62: Inverter reset (RES) 63: PTC thermistor input (PTC) (assigned to AU terminal (*Pr. 184*) only) 64: PID forward/reverse action switchover (X64) 65: PU/NET operation switchover (X65) 66: External/NET operation switchover (X66) 67: Command source switchover (X67) 68: Simple position pulse train sign (NP) *1 69: Simple position droop pulse clear (CLR) *1 70: DC feeding operation permission (X70) 71: DC feeding cancel (X71) 74: Magnetic flux decay output shutoff (X74) 76: Proximity dog (X76) (assigned to JOG terminal (*Pr. 185*) only) *2 9999:No function *1 Available only when used with the FR-A7AP/FR-A7AL. *2 Available only when used with the FR-A7NS.	○	×	○
	179		STR terminal function selection	1	61	0 to 20, 22 to 28, 42 to 44, 61, 62, 64 to 71, 74, 9999		○	×	○
	180		RL terminal function selection	1	0	0 to 20, 22 to 28, 42 to 44, 62, 64 to 71, 74, 9999		○	×	○
	181		RM terminal function selection	1	1			○	×	○
	182		RH terminal function selection	1	2			○	×	○
	183		RT terminal function selection	1	3			○	×	○
	184		AU terminal function selection	1	4	0 to 20, 22 to 28, 42 to 44, 62 to 71, 74, 9999		○	×	○
	185		JOG terminal function selection	1	5	0 to 20, 22 to 28, 42 to 44, 62, 64 to 71, 74, 76, 9999		○	×	○
	186		CS terminal function selection	1	6	0 to 20, 22 to 28, 42 to 44, 62, 64 to 71, 74, 9999		○	×	○
	187		MRS terminal function selection	1	24			○	×	○
	188		STOP terminal function selection	1	25			○	×	○
	189		RES terminal function selection	1	62			○	×	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Terminal assignment of output terminal	190		RUN terminal function selection	1	0	0 to 8, 10 to 20, 25 to 28, 30 to 36, 39, 41 to 47, 55, 64, 70, 84, 85, 90 to 99, 100 to 108, 110 to 116, 120, 125 to 128, 130 to 136, 139, 141 to 147, 155, 164, 170, 184, 185, 190 to 199, 9999	0, 100: Inverter running (RUN) 1, 101: Up to frequency (SU) 2, 102: Instantaneous power failure/ undervoltage (IPF) 3, 103: Overload alarm (OL) 4, 104: Output frequency detection (FU) 5, 105: Second output frequency detection (FU2) 6, 106: Third output frequency detection (FU3) 7, 107: Regenerative brake pre-alarm (RBP) 8, 108: Electronic thermal O/L relay pre-alarm (THP) 10, 110:PU operation mode (PU) 11, 111: Inverter operation ready (RY) 12, 112:Output current detection (Y12) 13, 113:Zero current detection (Y13) 14, 114:PID lower limit (FDN) 15, 115:PID upper limit (FUP) 16, 116:PID forward/reverse rotation output (RL) 17, —: Electronic bypass MC1 (MC1) 18, —: Electronic bypass MC2 (MC2) 19, —: Electronic bypass MC3 (MC3) 20, 120:Brake opening request (BOF) 25, 125:Fan fault output (FAN) 26, 126:Heatsink overheat pre-alarm (FIN) 27, 127:Orientation complete (ORA) *1 28, 128:Orientation fault (ORM) *1 30, 130:Forward rotation output (Y30) *1 31, 131:Reverse rotation output (Y31) *1 32, 132:Regenerative status output (Y32) *1 33, 133:Operation ready 2 (RY2) 34, 134:Low speed output (LS) 35, 135:Torque detection (TU) 36, 136:In-position (Y36)*1 39, 139:Start time tuning completion (Y39) 41, 141:Speed detection (FB) 42, 142:Second speed detection (FB2) 43, 143:Third speed detection (FB3) 44, 144:Inverter running 2 (RUN2) 45, 145:Inverter running and start command is ON (RUN3) 46, 146:During deceleration at occurrence of power failure (retained until release) (Y46) 47, 147:During PID control activated (PID) 55, 155:Motor temperature detection (Y55) *2 64, 164:During retry (Y64) 70, 170:PID output interruption (SLEEP) 84, 184:Preparation ready signal (RDY) *1 85, 185:DC current feeding (Y85) 90, 190:Life alarm (Y90) 91, 191:Fault output 3 (power-off signal) (Y91) 92, 192:Energy saving average value updated timing (Y92) 93, 193:Current average monitor signal (Y93) 94, 194:Fault output 2 (ALM2) 95, 195:Maintenance timer signal (Y95) 96, 196:Remote output (REM) 97, 197:Alarm output 2 (ER) 98, 198:Alarm output (LF) 99, 199:Fault output (ALM) 9999: No function 0 to 99: Positive logic 100 to 199: Negative logic *1 Available only when used with the FR-A7AP/FR-A7AL. *2 Available only when FR-A7AZ is mounted and SFV5RU□□□□□T/A is used.	○	×	○
	191		SU terminal function selection	1	1			○	×	○
	192		IPF terminal function selection	1	2			○	×	○
	193		OL terminal function selection	1	3			○	×	○
	194		FU terminal function selection	1	4			○	×	○
	195		ABC1 terminal function selection	1	99	0 to 8, 10 to 20, 25 to 28, 30 to 36, 39, 41 to 47, 55, 64, 70, 84, 85, 90, 91, 94 to 99, 100 to 108, 110 to 116, 120, 125 to 128, 130 to 136, 139, 141 to 147, 155, 164, 170, 184, 185, 190, 191, 194 to 199, 9999		○	×	○
	196		ABC2 terminal function selection	1	9999			○	×	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
—	232 to 239		Refer to *Pr. 4 to Pr. 6*.								
	240		Refer to *Pr. 72*.								
	241		Refer to *Pr. 125 and Pr. 126*.								
	242, 243		Refer to *Pr. 73*.								
Increase cooling fan life	244		Cooling fan operation selection	1	1	0	Operates at power on Cooling fan on/off control invalid (The cooling fan is always on at power on)		○	○	○
						1	Cooling fan on/off control valid The fan is normally on during inverter operation. The fan switches on/off according to the temperature during a stop of the inverter whose status is monitored.				
Slip compensation V/F	245		Rated slip	0.01%	9999	0 to 50%	Used to set the rated motor slip.		○	○	○
						9999	No slip compensation				
	246		Slip compensation time constant	0.01s	0.5s	0.01 to 10s	Used to set the response time of slip compensation. When the value is made smaller, response will be faster. However, as load inertia is greater, a regenerative overvoltage (E.OV□) error is more liable to occur.		○	○	○
	247		Constant-power range slip compensation selection	1	9999	0	Slip compensation is not made in the constant power range (frequency range above the frequency set in *Pr. 3*)		○	○	○
						9999	Slip compensation is made in the constant power range.				
Selection of motor stopping method	250		Stop selection	0.1s	9999	0 to 100s	The motor is coasted to a stop when the preset time elapses after the start signal is turned off.	STF signal: Forward rotation start STR signal: Reverse rotation start	○	○	○
						1000 to 1100s	The motor is coasted to a stop (*Pr. 250* - 1000)s after the start signal is turned off.	STF signal: Start signal STR signal: Forward/reverse signal			
						9999	When the start signal is turned off, the motor decelerates to stop.	STF signal: Forward rotation start STR signal: Reverse rotation start			
						8888		STF signal: Start signal STR signal: Forward/reverse signal			
Input/output phase failure protection selection	251		Output phase loss protection selection	1	1	0	Without output phase loss protection		○	○	○
						1	With output phase loss protection				
		872	Input phase loss protection selection	1	0	0	Without input phase loss protection		○	○	○
						1	With input phase loss protection				
—	252, 253		Refer to *Pr. 73*.								

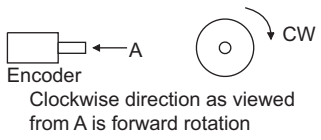
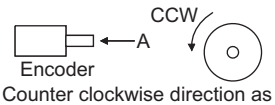
Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Display of the life of the inverter parts	255		Life alarm status display	1	0	(0 to 15)	Display whether the control circuit capacitor, main circuit capacitor, cooling fan, and each parts of the inrush current limit circuit has reached the life alarm output level or not. Reading only	×	×	×
	256		Inrush current limit circuit life display	1%	100%	(0 to 100%)	Display the deterioration degree of the inrush current limit circuit. Reading only	×	×	×
	257		Control circuit capacitor life display	1%	100%	(0 to 100%)	Display the deterioration degree of the control circuit capacitor. Reading only	×	×	×
	258		Main circuit capacitor life display	1%	100%	(0 to 100%)	Display the deterioration degree of the main circuit capacitor. Reading only The value measured by *Pr. 259* is displayed.	×	×	×
	259		Main circuit capacitor life measuring	1	0	0, 1	Setting "1" and turning the power supply off starts the measurement of the main circuit capacitor life. When the *Pr.259* value is "3" after powering on again, the measuring is completed. Read the deterioration degree in *Pr.258*.	○	○	○
Operation at instantaneous power failure	261		Power failure stop selection	1	0	0	Coasting to stop When undervoltage or power failure occurs, the inverter output is shut off.	○	○	○
						1	Without undervoltage avoidance	When undervoltage or a power failure occurs, the inverter can be decelerated to a stop.			
						11	With undervoltage avoidance				
						2	Without undervoltage avoidance	When undervoltage or a power failure occurs, the inverter can be decelerated to a stop. If power is restored during a power failure, the inverter accelerates again.			
						12	With undervoltage avoidance				
	262		Subtracted frequency at deceleration start	0.01Hz	3Hz	0 to 20Hz	Normally operation can be performed with the initial value unchanged. But adjust the frequency according to the magnitude of the load specifications (moment of inertia, torque).	○	○	○
	263		Subtraction starting frequency	0.01Hz	60Hz	0 to 120Hz	When output frequency ≥ *Pr. 263* Decelerate from the speed obtained from output frequency minus *Pr. 262*. When output frequency < *Pr. 263* Decelerate from output frequency	○	○	○
						9999	Decelerate from the speed obtained from output frequency minus *Pr. 262*.			
	264		Power-failure deceleration time 1	0.1/ 0.01s	5s	0 to 3600/ 360s	Set a deceleration slope down to the frequency set in *Pr. 266*.	○	○	○
	265		Power-failure deceleration time 2	0.1/ 0.01s	9999	0 to 3600/ 360s	Set a deceleration slope below the frequency set in *Pr. 266*.	○	○	○
						9999	Same slope as in *Pr. 264*			
	266		Power failure deceleration time switchover frequency	0.01Hz	60Hz	0 to 400Hz	Set the frequency at which the deceleration slope is switched from the *Pr. 264* setting to the *Pr. 265* setting.	○	○	○
		294	UV avoidance voltage gain	0.1%	100%	0 to 200%	Adjust response level at undervoltage avoidance operation. A larger setting will improve responsiveness to the bus voltage change.	○	○	○

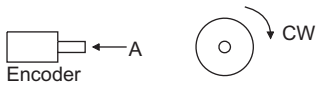
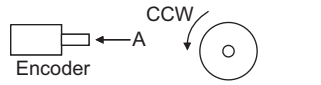
Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
—	267		Refer to *Pr. 73*.							
	268		Refer to *Pr. 52*.							
	269		Parameter for manufacturer setting. Do not set.							
Load torque high speed frequency control	270		Stop-on contact/ load torque high-speed frequency control selection	1	0	0	Without stop-on contact control and load torque high-speed frequency control	○	○	○
						1	Stop-on contact control			
						2	Load torque high speed frequency control			
						3	Stop-on contact + load torque high speed frequency control			
						11	Stop-on contact control (E.OLT invalid under stop-on-contact control)			
						13	Stop-on contact + load torque high speed frequency control (E.OLT invalid under stop-on-contact control)			
	271		High-speed setting maximum current	0.1%	50%	0 to 220%	Set the upper and lower limits of the current at high and middle speeds.	○	○	○
	272		Middle-speed setting minimum current	0.1%	100%	0 to 220%		○	○	○
	273		Current averaging range	0.01Hz	9999	0 to 400Hz	Average current during acceleration from (*Pr. 273* × 1/2)Hz to (*Pr. 273*)Hz can be achieved.	○	○	○
						9999	Average current during acceleration from (*Pr. 5* × 1/2)Hz to (*Pr. 5*)Hz is achieved.			
	274		Current averaging filter time constant	1	16	1 to 4000	Set the time constant of the primary delay filter relative to the output current. (The time constant [ms] is 0.75 × *Pr. 274* and the initial value is 12ms.) A larger setting provides higher stability but poorer response.	○	○	○
Stop-on contact control Sensorless Magnetic flux	270		Stop-on contact/ load torque high-speed frequency control selection	1	0	0	Without stop-on contact control and load torque high-speed frequency control	○	○	○
						1	Stop-on contact control			
						2	Load torque high speed frequency control			
						3	Stop-on contact + load torque high speed frequency control			
						11	Stop-on contact control (E.OLT invalid under stop-on-contact control)			
						13	Stop-on contact + load torque high speed frequency control (E.OLT invalid under stop-on-contact control)			
	275		Stop-on contact excitation current low-speed multiplying factor	0.1%	9999	0 to 1000%	Usually set a value between 130% and 180%. Set the force (holding torque) for stop-on-contact control.	○	○	○
						9999	No compensation.			
	276		PWM carrier frequency at stop-on contact	1	9999	0 to 9/ 0 to 4 *	Set a PWM carrier frequency for stop-on-contact control. (Valid at the output frequency of 3Hz or less.) * The setting range differs according to the inverter capacity. (55K or lower/75k or higher)	○	○	○
						9999	As set in *Pr. 72 PWM frequency selection*.			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Brake sequence function (Vector, Sensorless, Magnetic flux)	278		Brake opening frequency	0.01Hz	3Hz	0 to 30Hz	Set to the rated slip frequency of the motor + about 1.0Hz. This parameter may be only set if *Pr. 278* ≤ *Pr. 282*.	○	○	○
	279		Brake opening current	0.1%	130%	0 to 220%	Generally, set this parameter to about 50 to 90%. If the setting is too low, the load is liable to drop due to gravity at start. Suppose that the rated inverter current is 100%.	○	○	○
	280		Brake opening current detection time	0.1s	0.3s	0 to 2s	Generally, set this parameter to about 0.1 to 0.3s.	○	○	○
	281		Brake operation time at start	0.1s	0.3s	0 to 5s	*Pr. 292* = 7: Set the mechanical delay time until the brake is loosened. *Pr. 292* = 8: Set the mechanical delay time until the brake is loosened + about 0.1 to 0.2s.	○	○	○
	282		Brake operation frequency	0.01Hz	6Hz	0 to 30Hz	At this frequency, the brake opening request signal (BOF) is switched off. Generally, set this parameter to the *Pr. 278* setting + 3 to 4Hz. Setting is enabled only when *Pr. 282* ≥ *Pr. 278*.	○	○	○
	283		Brake operation time at stop	0.1s	0.3s	0 to 5s	*Pr. 292* = 7: Set the mechanical delay time until the brake is closed + 0.1s. *Pr. 292* = 8: Set the mechanical delay time until the brake is closed + about 0.2 to 0.3s.	○	○	○
	284		Deceleration detection function selection	1	0	0	Deceleration is not detected.	○	○	○
						1	If deceleration is not normal during deceleration operation, the inverter fault (E.MB2) is provided to trip the inverter and turn off the brake opening request signal (BOF).			
	285		Overspeed detection frequency	0.01Hz	9999	0 to 30Hz	When brake sequence function is valid under encoder feedback control If (detected frequency) - (output frequency) > *Pr. 285* under encoder feedback control, the inverter fault (E.MB1) is provided to trip the inverter and turn off the brake opening request signal (BOF).	○	○	○
						9999	Overspeed is not detected.			
		292	Automatic acceleration/ deceleration	1	0	0, 1, 3, 5 to 8, 11	Brake sequence function is valid when a setting is "7 or 8".			
Speed deviation excess detection (Vector)	285		Excessive speed deviation detection frequency	0.01Hz	9999	9999	Without speed deviation excessive	○	○	○
						0 to 30Hz	If the difference (absolute value) between the speed command value and actual speed exceeds the *Pr. 285 Speed deviation excess detection frequency* setting for longer than the time set in *Pr. 853 Speed deviation time* during speed control under vector control, speed deviation excessive occurs and error "E. OSD" appears, resulting in a stop.			
		853	Speed deviation time	0.1s	1s	0 to 100s		○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
Droop control (Vector / Sensorless / Magnetic flux)	286		Droop gain	0.1%	0%	0	Droop control is invalid		○	○	○
						0.1 to 100%	Set the drooping amount at the rated torque as a percentage with respect to the rated frequency.				
	287		Droop filter time constant	0.01s	0.3s	0 to 1s	Set the time constant of the primary delay filter applied to the torque current.		○	○	○
	288		Droop function activation selection	1	0		**Real sensor less vector/vector control**	**Advanced magnetic flux vector control**	○	○	○
						0, 10	Droop control is not exercised during acceleration/ deceleration. (When *Pr.288* = 10, droop compensation amount is determined using the motor speed as reference.)	Droop control is not exercised during acceleration/ deceleration. Droop compensation amount is determined using the rated motor frequency as reference.			
						1, 11	Droop control is always exercised during operation. (with 0 limit) (When *Pr.288* = 11, droop compensation amount is determined using the motor speed as reference.)				
						2	Droop control is always exercised during operation. (without 0 limit)				
Pulse train I/O	291		Pulse train I/O selection	1	0		**Input**	**Output**	○	×	○
						0	JOG terminal	FM output			
						1	Pulse train input	FM output			
						10	JOG terminal	Pulse train open collector output (50% duty)			
						11	Pulse train input				
						20	JOG terminal	Pulse train open collector output (ON width is always same)			
						21	Pulse train input				
						100		Pulse train open collector output (ON width is always same (independently of *Pr. 54*))			
		384	Input pulse division scaling factor	1	0	0 to 250	Indicates division scaling factor to the input pulse and the frequency resolution to the input pulse changes according to the value.		○	○	○
		385	Frequency for zero input pulse	0.01Hz	0	0 to 400Hz	Set the frequency when the input pulse is 0 (bias).		○	○	○
		386	Frequency for maximum input pulse	0.01Hz	60Hz	0 to 400Hz	Set the frequency when the input pulse is maximum (gain).		○	○	○
—	292, 293		Refer to *Pr. 61*.								
—	294		Refer to *Pr. 261*.								
Password function	296		Password lock level	1	9999	0 to 6, 99, 100 to 106, 199	Select restriction level of parameter reading/ writing when a password is registered.		○	×	○
						9999	No password lock				
	297		Password lock/ unlock	1	9999	1000 to 9998	Register a 4-digit password		○	×	○
						(0 to 5)*	Displays password unlock error count. (Reading only) (Valid when *Pr. 296* = "100" to "106, 199")	* "0 or 9999" can be set in *Pr. 297* at any time although the setting is invalid (the displayed value does not change).			
						9999*	No password lock				
—	299		Refer to *Pr. 57*.								

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
RS-485 communication	331		RS-485 communication station number	1	0	0 to 31 (0 to 247)	Set the inverter station number. (same specifications as *Pr. 117*) When "1" (Modbus-RTU protocol) is set in *Pr. 551*, the setting range within parenthesis is applied.	○	○*	○*
	332		RS-485 communication speed	1	96	3, 6, 12, 24, 48, 96, 192, 384	Used to select the communication speed. (same specifications as *Pr. 118*)	○	○*	○*
	333		RS-485 communication stop bit length	1	1	0, 1, 10, 11	Select stop bit length and data length. (same specifications as *Pr. 119*)	○	○*	○*
	334		RS-485 communication parity check selection	1	2	0, 1, 2	Select the parity check specifications. (same specifications as *Pr. 120*)	○	○*	○*
	335		RS-485 communication retry count	1	1	0 to 10, 9999	Set the permissible number of retries at occurrence of a data receive error. (same specifications as *Pr. 121*)	○	○*	○*
	336		RS-485 communication check time interval	0.1s	0s	0	RS-485 communication can be made, but the inverter trips in the NET operation mode.	○	○*	○*
						0.1 to 999.8s	Set the communication check time interval. (same specifications as *Pr. 122*)			
						9999	No communication check (signal loss detection)			
	337		RS-485 communication waiting time setting	1	9999	0 to 150ms, 9999	Set the waiting time between data transmission to the inverter and response. (same specifications as *Pr. 123*)	○	○*	○*
	338		Communication operation command source	1	0	0	Operation command source communication	○	○*	○*
						1	Operation command source external			
	339		Communication speed command source	1	0	0	Speed command source communication	○	○*	○*
						1	Speed command source external (Frequency setting from communication is invalid, terminal 2 and 1 setting from external is valid)			
						2	Speed command source external (Frequency setting from communication is valid, terminal 2 and 1 setting from external is invalid)			
	341		RS-485 communication CR/LF selection	1	1	0, 1, 2	Select presence/absence of CR/LF. (same specifications as *Pr. 124*)	○	○*	○*
	342		Communication EEPROM write selection	1	0	0	Parameter values written by communication are written to the EEPROM and RAM.	○	○	○
						1	Parameter values written by communication are written to the RAM.			
	343		Communication error count	1	0	—	Display the number of communication errors during Modbus-RTU communication. Read only. Displayed only when Modbus-RTU protocol is selected.	×	×	×
		539	Modbus-RTU communication check time interval	0.1s	9999	0	Modbus-RTU communication can be made, but the inverter trips in the NET operation mode.	○	○*	○*
						0.1 to 999.8s	Set the communication check time interval. (same specifications as Pr. 122)			
						9999	No communication check (signal loss detection)			
		549	Protocol selection	1	0	0	Mitsubishi inverter (computer link) protocol	After setting change, reset (switch power off, then on) the inverter. The setting change is reflected after a reset.	○	○*	○*
						1	Modbus-RTU protocol			
		550	NET mode operation command source selection	1	9999	0	Communication option valid	○	○*	○*
						1	Inverter RS-485 terminal valid			
						9999	Automatic recognition of the communication option Normally, the RS-485 terminals are valid. Communication option is valid when the communication option is mounted.			
		551	PU mode operation command source selection	1	2	1	Select the RS-485 terminals as the PU operation mode control source.	○	○*	○*
						2	Select the PU connector as the PU operation mode control source.			
						3	Select the USB connector as the PU operation mode control source.			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
—	340		Refer to *Pr. 79*.							
	341 to 343		Refer to *Pr. 117*.							
Orientation control (Vector, Magnetic flux, V/F)	350		Stop position command selection	1	9999	0	Internal stop position command *(Pr.356)*	○	○	○
						1	External stop position command (FR-A7AX 16-bit data)			
						9999	Orientation control invalid			
	351		Orientation speed	0.01Hz	2Hz	0 to 30Hz	Decrease the motor speed to the set value when the orientation command (X22) is given.	○	○	○
	352		Creep speed	0.01Hz	0.5Hz	0 to 10Hz	As soon as the current position pulse reaches the creep switchover position set in *Pr.353* after the speed has reached the orientation speed, the speed decelerates down to the creep speed set in *Pr.352*.	○	○	○
	353		Creep switchover position	1	511	0 to 16383		○	○	○
	354		Position loop switchover position	1	96	0 to 8191	As soon as the current position pulse reaches the set position loop switchover position, control is changed to position loop.	○	○	○
	355		DC injection brake start position	1	5	0 to 255	After changed to position loop, DC injection brake is applied and the motor stops as soon as the current position pulse reaches the set DC injection brake start position.	○	○	○
	356		Internal stop position command	1	0	0 to 16383	When "0" is set in *Pr. 350*, the internal position command is activated and the setting value of *Pr. 356* becomes a stop position.	○	○	○
	357		Orientation in-position zone	1	5	0 to 255	Set the in-position zone at a stop of the orientation.	○	○	○
	358		Servo torque selection	1	1	0 to 13	Functions at orientation completion can be selected.	○	○	○
	359		Encoder rotation direction	1	1	0	 Clockwise direction as viewed from A is forward rotation	○	○	○
						1	 Counter clockwise direction as viewed from A is forward rotation			
	360		16 bit data selection	1	0	0	Speed command	When 1 is set in *Pr.350* and the option FR-A7AX is mounted, set a stop position using 16-bit data. Stop position command is input as binary regardless of the *Pr.304* setting.	○	○	○
						1	Position command 16 bit data is used as external position command as is.			
						2 to 127	Set the stop position dividing up to 128 stop positions at regular intervals.			
	361		Position shift	1	0	0 to 16383	Shift the origin using a compensation value without changing the origin of the encoder. The stop position is a position obtained by adding the setting value of *Pr. 361* to the position command.	○	○	○
	362		Orientation position loop gain	0.1	1	0.1 to 10	When servo torque function is selected using *Pr.358*, output frequency for generating servo torque increases to the creep speed of *Pr.352* gradually according to the slope set in *Pr.362*. Although the operation becomes faster when the value is increased, a machine may hunt, etc.	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Orientation control (Vector, Magnetic flux, V/F)	363		Completion signal output delay time	0.1s	0.5s	0 to 5s	The orientation complete signal (ORA) is output delaying the set time after in-position zone is entered. Also, the signal turns off delaying the set time after in-position zone is out.	○	○	○
	364		Encoder stop check time	0.1s	0.5s	0 to 5s	Orientation fault signal (ORM) is output when the encoder remains stopped for the set time without orientation completion in the state where no orientation complete signal (ORA) is output. ORM signal is output when orientation is not completed again in the set time in the state where ORA signal is output.	○	○	○
	365		Orientation limit	1s	9999	0 to 60s	Measure the time taken after passing the creep switchover position and output the orientation fault signal (ORM) if orientation is not completed within the set time.	○	○	○
						9999	Set to 120s.			
	366		Recheck time	0.1s	9999	0 to 5s	Turning off the start signal with orientation command (X22) on after stopping the motor by orientation control, the present position is checked again after the set time elapses and the orientation complete signal (ORA) or orientation fault signal (ORM) is output.	○	○	○
						9999	Not checked.			
		369	Number of encoder pulses	1	1024	0 to 4096	Set the number of pulses of the encoder. Set the number of pulses before multiplied by four.	○	○	○
		393	Orientation selection	1	0	0	Orientation is executed from the current rotation direction.	○	○	○
						1	Orientation is executed from the forward rotation direction.			
						2	Orientation is executed from the reverse rotation direction.			
		396	Orientation speed gain (P term)	1	60	0 to 1000	Servo rigidity is (response level during position control loop) at orientation stop can be adjusted.	○	○	○
		397	Orientation speed integral time	0.001s	0.333s	0 to 20.0s		○	○	○
		398	Orientation speed gain (D term)	0.1%	1%	0 to 100.0%	Lag/advance compensation gain can be adjusted.	○	○	○
		399	Orientation deceleration ratio	1	20	0 to 1000	Make adjustment when the motor runs back at orientation stop or the orientation time is long.	○	○	○
Encoder feedback control (Magnetic flux, V/F)	359		Encoder rotation direction	1	1	0	 Clockwise direction as viewed from A is forward rotation	○	○	○
						1	 Counter clockwise direction as viewed from A is forward rotation			
	367		Speed feedback range	0.01Hz	9999	0 to 400Hz	Set the range of speed feedback control.	○	○	○
						9999	Encoder feedback control is invalid			
	368		Feedback gain	0.1	1	0 to 100	Set when the rotation is unstable or response is slow.	○	○	○
	369		Number of encoder pulses	1	1024	0 to 4096	Set the number of pulses of the encoder. Set the number of pulses before multiplied by four.	○	○	○
Overspeed detection	374		Overspeed detection level	0.01Hz	140Hz	0 to 400Hz	When the motor speed reaches or exceeds the speed set in *Pr.374* during encoder feedback control, Real sensorless vector control, or vector control, over speed (E.OS) occurs and stops the inverter output.	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Encoder signal cable breakage detection (Vector, Magnetic flux, V/F)	376		Encoder signal loss detection enable/ disable selection	1	0	0	Signal loss detection is invalid	○	○	○
						1	Signal loss detection is valid When the cable of the encoder signal is broken during encoder feedback control, orientation control, or vector control, signal loss detection (E.ECT) is activated to stop the inverter output.			
—	380 to 383		Refer to *Pr. 29*.							
	384 to 386		Refer to *Pr. 291*.							
Position control (Vector)	419		Position command source selection	1	0	0	Simple position control function by contact input	○	○	○
						1	Position command using pulse train input (FR-A7AL)			
						2	Simple position pulse train command by pulse train input from the JOG terminal			
	420		Command pulse scaling factor numerator	1	1	0 to 32767	Set the electronic gear. *Pr. 420* is a numerator and *Pr. 421* is a denominator.	○	○	○
	421		Command pulse scaling factor denominator	1	1	0 to 32767		○	○	○
	422		Position loop gain	$1s^{-1}$	$25s^{-1}$	0 to $150s^{-1}$	Set the gain of the position loop.	○	○	○
	423		Position feed forward gain	1%	0%	0 to 100%	Function to cancel a delay caused by the droop pulses of the deviation counter.	○	○	○
	424		Position command acceleration/deceleration time constant	0.001s	0s	0 to 50s	Used when rotation has become unsmooth at a large electronic gear ratio (about 10 times or more) and low speed.	○	○	○
	425		Position feed forward command filter	0.001s	0s	0 to 5s	Enters the primary delay filter in response to the feed forward command.	○	○	○
	426		In-position width	1 pulse	100 pulse	0 to 32767 pulse	The in-position signal (Y36) turns on when the droop pulses become less than the setting.	○	○	○
	427		Excessive level error	1	40K	0 to 400K	A position error excessive (E.OD) occurs when the droop pulses exceed the setting.	○	○	○
						9999	Function invalid			
	428		Command pulse selection	1	0	0 to 2	Pulse train + rotation signal sign — Negative logic	○	○	○
						3 to 5	Pulse train + rotation signal sign — Positive logic			
	429		Clear signal selection	1	1	0	Deviation counter is cleared at trailing edge (at the moment when H level is changed to L level)	○	○	○
						1	Deviation counter is cleared at L level			
	430		Pulse monitor selection	1	9999		**Description** / **FR-DU07 (FR-PU04/ FR-PU07) display**	○	○	○
						0	The cumulative command pulse value is displayed. — Lower 4(5) digits			
						1	The cumulative command pulse value is displayed. — Upper 4(5) digits			
						2	The cumulative feedback pulse value is displayed. — Lower 4(5) digits			
						3	The cumulative feedback pulse value is displayed. — Upper 4(5) digits			
						4	The droop pulses are monitored. — Lower 4(5) digits			
						5	The droop pulses are monitored. — Upper 4(5) digits			
						9999	Frequency monitor is displayed.			
		464	Digital position control sudden stop deceleration time	0.1s	0	0 to 360.0s	Set the time until the inverter stops when the forward rotation (reverse rotation) command is turned off with the position feed forward function.	○	○	○
—	450		Refer to *Pr. 71*.							
	451		Refer to *Pr. 80*.							
	453, 454		Refer to *Pr. 80*.							
	455 to 463		Refer to *Pr. 82*.							
	464		Refer to *Pr. 430*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
							Selection Method	Position Feed Speed			
Simple position feed function Vector	465		First position feed amount lower 4 digits	1	0	0 to 9999	RH	High speed *(Pr.4)*	○	○	○
	466		First position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	467		Second position feed amount lower 4 digits	1	0	0 to 9999	RM	Middle speed *(Pr.5)*	○	○	○
	468		Second position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	469		Third position feed amount lower 4 digits	1	0	0 to 9999	RL	Low speed *(Pr.6)*	○	○	○
	470		Third position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	471		Fourth position feed amount lower 4 digits	1	0	0 to 9999	RM, RL	Speed 4 *(Pr.24)*	○	○	○
	472		Fourth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	473		Fifth position feed amount lower 4 digits	1	0	0 to 9999	RH, RL	Speed 5 *(Pr.25)*	○	○	○
	474		Fifth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	475		Sixth position feed amount lower 4 digits	1	0	0 to 9999	RH, RM	Speed 6 *(Pr.26)*	○	○	○
	476		Sixth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	477		Seventh position feed amount lower 4 digits	1	0	0 to 9999	RH, RM, RL	Speed 7 *(Pr.27)*	○	○	○
	478		Seventh position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	479		Eighth position feed amount lower 4 digits	1	0	0 to 9999	REX	Speed 8 *(Pr.232)*	○	○	○
	480		Eighth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	481		Ninth position feed amount lower 4 digits	1	0	0 to 9999	REX, RL	Speed 9 *(Pr.233)*	○	○	○
	482		Ninth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	483		Tenth position feed amount lower 4 digits	1	0	0 to 9999	REX, RM	Speed 10 *(Pr.234)*	○	○	○
	484		Tenth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	485		Eleventh position feed amount lower 4 digits	1	0	0 to 9999	REX, RM, RL	Speed 11 *(Pr.235)*	○	○	○
	486		Eleventh position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	487		Twelfth position feed amount lower 4 digits	1	0	0 to 9999	REX, RH	Speed 12 *(Pr.236)*	○	○	○
	488		Twelfth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	489		Thirteenth position feed amount lower 4 digits	1	0	0 to 9999	REX, RH, RL	Speed 13 *(Pr.237)*	○	○	○
	490		Thirteenth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	491		Fourteenth position feed amount lower 4 digits	1	0	0 to 9999	REX, RH, RM	Speed 14 *(Pr.238)*	○	○	○
	492		Fourteenth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○
	493		Fifteenth position feed amount lower 4 digits	1	0	0 to 9999	REX, RH, RM, RL	Speed 15 *(Pr.239)*	○	○	○
	494		Fifteenth position feed amount upper 4 digits	1	0	0 to 9999			○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description		Parameter copy	Parameter clear	All parameter clear
									○: enabled ×: disabled		
Remote output function (REM signal)	495		Remote output selection	1	0	0	Remote output data clear at powering off	Remote output data is cleared during an inverter reset	○	○	○
						1	Remote output data held at powering off				
						10	Remote output data clear at powering off	Remote output data is retained during an inverter reset			
						11	Remote output data held at powering off				
	496		Remote output data 1	1	0	0 to 4095	Output terminal can be switched on and off.		×	×	×
	497		Remote output data 2	1	0	0 to 4095			×	×	×
Maintenance of parts	503		Maintenance timer	1	0	0 (1 to 9998)	Display the cumulative energization time of the inverter in 100h increments. Reading only Writing the setting of "0" clears the cumulative energization time.		×	×	×
	504		Maintenance timer alarm output set time	1	9999	0 to 9998	Set the time taken until when the maintenance timer alarm output signal (Y95) is output.		○	×	○
						9999	No function				
—	505		Refer to *Pr. 37*.								
—	516 to 519		Refer to *Pr. 29*.								
	539		Refer to *Pr. 331*.								
Inverter setup using USB communication	547		USB communication station number	1	0	0 to 31	Specify the inverter station number.		○	○	○
	548		USB communication check time interval	0.1s	9999	0	USB communication is enabled. However, the inverter will come to an alarm stop (E. USB) if operation is changed to PU operation mode.		○	○	○
						0.1 to 999.8s	Set the interval of communication check time.				
						9999	No communication check				
—	549 to 551		Refer to *Pr. 343*.								
Current average value monitor signal	555		Current average time	0.1s	1s	0.1 to 1.0s	Set the time taken to average the current during start bit output (1s).		○	○	○
	556		Data output mask time	0.1s	0s	0.0 to 20.0s	Set the time for not obtaining (mask) transient state data.		○	○	○
	557		Current average value monitor signal output reference current	0.01/ 0.1A *	Rated inverter current	0 to 500/ 0 to 3600A *	Set the reference (100%) for outputting the signal of the current average value. * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)		○	○	○
—	563, 564		Refer to *Pr. 52*.								
	569		Refer to *Pr. 80*.								
	571		Refer to *Pr. 13*.								
	574		Refer to *Pr. 95*.								
	575 to 577		Refer to *Pr. 127*.								
	611		Refer to *Pr. 57*.								
	665		Refer to *Pr. 882*.								
	684		Refer to *Pr. 82*.								
	800		Refer to *Pr. 81*.								
	802		Refer to *Pr. 10*.								
	803		Refer to *Pr. 22*.								

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Torque command source selection Vector Sensorless	804		Torque command source selection	1	0	0	Torque command by terminal 1 analog input	○	○	○
						1	Torque command by parameter *Pr.805* or *Pr.806* setting (-400% to 400%)			
						2	Torque command using pulse train input (FR-A7AL)			
						3	Torque command by using CC-Link (FR-A7NC)			
						4	Digital input from the option (FR-A7AX)			
						5	Torque command by using CC-Link (FR-A7NC)			
						6				
	805		Torque command value (RAM)	1%	1000%	600 to 1400%	Digital setting of the torque command can be made by setting *Pr. 805* or *Pr. 806*. (Setting from communication option, etc. can be made.) In this case, set the speed limit value to an appropriate value to prevent overspeed.	×	○	○
	806		Torque command value (RAM,EEPROM)	1%	1000%	600 to 1400%		○	○	○
Speed limit Vector Sensorless	807		Speed limit selection	1	0	0	Use the speed command value during speed control as speed limit.	○	○	○
						1	According to *Pr. 808* and *Pr. 809*, set the speed limit in forward and reverse rotation directions individually.			
						2	The analog voltage of the terminal 1 input is used to make speed limit. For 0 to 10V input, set the forward rotation speed limit. (The reverse rotation speed limit is *Pr. 1 Maximum frequency*) For -10 to 0V input, set the reverse rotation speed limit. (The forward rotation speed limit is *Pr. 1 Maximum frequency*.) The maximum frequency of both the forward and reverse rotations is *Pr. 1 Maximum frequency*.			
	808		Forward rotation speed limit	0.01Hz	60Hz	0 to 120Hz	Set the speed limit level during forward rotation. (valid when *Pr. 807* = 1)	○	○	○
	809		Reverse rotation speed limit	0.01Hz	9999	0 to 120Hz	Set the speed limit level during reverse rotation. (valid when *Pr. 807* = 1)	○	○	○
						9999	The setting is the same as that of the torque limit in the forward rotation direction.			
—	810		Refer to *Pr. 22*.							
—	811		Refer to *Pr. 22* and *Pr. 37*.							
—	812 to 817		Refer to *Pr. 22*.							
Easy gain tuning selection Vector Sensorless	818		Easy gain tuning response level setting	1	2	1 to 15	1 : Slow response ↓ 15 : Fast response	○	○	○
	819		Easy gain tuning selection	1	0	0	No tuning	○	×	○
						1	With load estimation (only under vector control) — The optimum gain is automatically set from the torque command and speed during motor operation.			
						2	Manual input of load (*Pr. 880*)			
Speed loop proportional gain setting Vector Sensorless	820		Speed control P gain 1	1%	60%	0 to 1000%	Set the proportional gain for speed control. (Increasing the value improves trackability in response to a speed command change and reduces speed variation with disturbance.)	○	○	○
		830	Speed control P gain 2	1%	9999	0 to 1000%	Second function of *Pr. 820* (valid when RT signal is on)	○	○	○
						9999	No function			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Speed control integral time setting Vector Sensorless	821		Speed control integral time 1	0.001s	0.333s	0 to 20s	Set the integral time during speed control. (Decrease the value to shorten the time taken for returning to the original speed if speed variation with disturbance occurs.)	○	○	○
		831	Speed control integral time 2	0.001s	9999	0 to 20s	Second function of *Pr. 821* (valid when the RT terminal is on)	○	○	○
						9999	No function			
—	822		Refer to *Pr. 74*.							
Speed detection filter function Vector	823		Speed detection filter 1	0.001s	0.001s	0 to 0.1s	Set the primary delay filter for the speed feedback.	○	○	○
		833	Speed detection filter 2	0.001s	9999	0 to 0.1s	Second function of *Pr. 823* (valid when RT signal is on)	○	○	○
						9999	No function	○	○	○
Current loop proportional gain setting Vector	824		Torque control P gain 1	1%	100%	0 to 200%	Set the proportional gain for the current control of the q and d axes. (Increasing the value improves trackability in response to a current command change and reduces current variation with disturbance.)	○	○	○
Sensorless		834	Torque control P gain 2	1%	9999	0 to 200%	Second function of *Pr. 824* (valid when the RT terminal is on)	○	○	○
						9999	No function			
Current control integral time setting Vector	825		Torque control integral time 1	0.1ms	5ms	0 to 500ms	Set the integral time for the current control of the q and d axes. (Decreasing the value shortens the time taken to return to the original torque if current variation with disturbance occurs.)	○	○	○
Sensorless		835	Torque control integral time 2	0.1ms	9999	0 to 500ms	Second function of *Pr. 825* (valid when the RT signal is on)	○	○	○
						9999	No function			
—	826		Refer to *Pr. 74*.							
Torque detection filter function Vector	827		Torque detection filter 1	0.001s	0s	0 to 0.1s	Set the primary delay filter for the current feedback.	○	○	○
Sensorless		837	Torque detection filter 2	0.001s	9999	0 to 0.1s	Second function of *Pr. 827* (valid when the RT signal is on)	○	○	○
						9999	No function			
Speed feed forward control, model adaptive speed control Vector Sensorless	828		Model speed control gain	1%	60%	0 to 1000%	Set the gain for model speed controller.	○	○	○
		877	Speed feed forward control/model adaptive speed control selection	1	0	0	Normal speed control is exercised	○	○	○
						1	Speed feed forward control is exercised.			
						2	Model adaptive speed control is enabled.			
		878	Speed feed forward filter	0.01s	0s	0 to 1s	Set the primary delay filter for the speed feed forward result calculated using the speed command and load inertia ratio.	○	○	○
		879	Speed feed forward torque limit	0.1%	150%	0 to 400%	Limits the maximum value of the speed feed forward torque.	○	○	○
		880	Load inertia ratio	0.1	7	0 to 200 times	Set the load inertia ratio. Inertia ratio found by easy gain turning.	○	×	○
		881	Speed feed forward gain	1%	0%	0 to 1000%	Set the feed forward calculation result as a gain.	○	○	○

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
—	830		Refer to *Pr. 820*.							
	831		Refer to *Pr. 821*.							
	832		Refer to *Pr. 74*.							
	833		Refer to *Pr. 823*.							
	834		Refer to *Pr. 824*.							
	835		Refer to *Pr. 825*.							
	836		Refer to *Pr. 74*.							
	837		Refer to *Pr. 827*.							
Torque bias function Vector	840		Torque bias selection	1	9999	0	Set the contact signal (X42, X43) based-torque bias amount using *Pr.841* to *Pr.843*.	○	○	○
						1	Set the terminal 1-based torque bias amount as desired in *C16* to *C19*. (forward rotation)			
						2	Set the terminal 1-based torque bias amount as desired in *C16* to *C19*. (reverse rotation)			
						3	The terminal 1-based torque bias amount can be set automatically in *C16* to *C19*, *Pr.846* according to the load.			
						9999	Without torque bias, rated torque 100%			
	841		Torque bias 1	1%	9999	600 to 999%	Negative torque bias amount (-400% to -1%)	○	○	○
	842		Torque bias 2			1000 to 1400%	Positive torque bias amount (0% to 400%)			
	843		Torque bias 3			9999	Without torque bias setting			
	844		Torque bias filter	0.001s	9999	0 to 5s	Time until torque rises.	○	○	○
						9999	Same operation as when 0s is set.			
	845		Torque bias operation time	0.01s	9999	0 to 5s	Time for maintaining torque equivalent to the torque bias amount.	○	○	○
						9999	Same operation as when 0s is set.			
	846		Torque bias balance compensation	0.1V	9999	0 to 10V	Set the voltage under balanced load.	○	○	○
						9999	Same operation as when 0V is set.			
	847		Fall-time torque bias terminal 1 bias	1%	9999	0 to 400%	Set the bias value of the torque command.	○	○	○
						9999	Same as at a rise time (*C16*, *C17*).			
	848		Fall-time torque bias terminal 1 gain	1%	9999	0 to 400%	Set the gain value of the torque command.	○	○	○
						9999	Same as at a rise time (*C18*, *C19*).			
—	849		Refer to *Pr. 74*.							
	850		Refer to *Pr. 10*.							
	853		Refer to *Pr. 285*.							
Excitation ratio Vector Sensorless	854		Excitation ratio	1%	100%	0 to 100%	Set the excitation ratio under no load.	○	○	○
Function assignment of analog input terminal	858		Terminal 4 function assignment	1	0	0	Frequency/speed command	○	×	○
						1	Magnetic flux command			
						4	Stall prevention/torque limit			
						9999	No function			
		868	Terminal 1 function assignment	1	0	0	Frequency setting auxiliary	○	×	○
						1	Magnetic flux command			
						2	Regenerative torque limit			
						3	Torque command			
						4	Stall prevention/torque limit/torque command			
						5	Forward/reverse rotation speed limit			
						6	Torque bias			
						9999	No function			

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
—	859, 860		Refer to *Pr. 82*.							
Notch filter Vector	862		Notch filter time constant	1	0	0 to 60	You can use the machine resonance speed to make this setting to reduce the response level of the machine resonance frequency band, avoiding machine resonance.	○	○	○
Notch filter Sensorless	863		Notch filter depth	1	0	0	Deep (-40dB)	○	○	○
						1	↑ (-14dB)			
						2	↓ (-8dB)			
						3	Shallow (-4dB)			
Torque detection Vector Sensorless	864		Torque detection	0.1%	150%	0 to 400%	You can make setting to output a signal if the motor torque exceeds the predetermined value.	○	○	○
—	865		Refer to *Pr. 41*.							
	866		Refer to *Pr. 55*.							
	867		Refer to *Pr. 52*.							
	868		Refer to *Pr. 858*.							
—	872		Refer to *Pr. 251*.							
Speed limit during speed control Vector	873		Speed limit	0.01Hz	20Hz	0 to 120Hz	Frequency is limited at the set frequency + *Pr.873* during vector control.	○	○	○
—	874		Refer to *Pr. 22*.							
Fault definition	875		Fault definition	1	0	0	At occurrence of any fault, output is shut off immediately. At this time, the fault output also turns on.	○	○	○
						1	At occurrence of external thermal operation (OHT), electronic thermal relay function (THM) or PTC thermistor function (PTC) fault, the motor is decelerated to a stop. At occurrence of a fault other than OHT, THM and PTC, inverter trips immediately. Same operation as when "0" is set is performed under position control.			
—	877 to 881		Refer to *Pr. 828*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Regeneration avoidance function	882		Regeneration avoidance operation selection	1	0	0	Regeneration avoidance function invalid	○	○	○
						1	Regeneration avoidance function is always valid			
						2	Regeneration avoidance function is valid only at constant speed			
	883		Regeneration avoidance operation level	0.1V	380 / 760VDC *	300 to 800V	Set the bus voltage level at which regeneration avoidance operates. When the bus voltage level is set to low, overvoltage error will be less apt to occur. However, the actual deceleration time increases. The set value must be higher than the power supply voltage × $\sqrt{2}$ * The initial value differs according to the voltage level. (200V class / 400V class)	○	○	○
	884		Regeneration avoidance at deceleration detection sensitivity	1	0	0	Regeneration avoidance by bus voltage change ratio is invalid	○	○	○
						1 to 5	Set sensitivity to detect the bus voltage change. Setting: 1 → 5 Detection sensitivity: Low → High			
	885		Regeneration avoidance compensation frequency limit value	0.01Hz	6Hz	0 to 10Hz	Set the limit value of frequency which rises at activation of regeneration avoidance function.	○	○	○
						9999	Frequency limit invalid			
	886		Regeneration avoidance voltage gain	0.1%	100%	0 to 200%	Adjust responsiveness at activation of regeneration avoidance. Setting a larger value in *Pr.886* will improve responsiveness to the bus voltage change. However, the output frequency could become unstable. When vibration is not suppressed by decreasing the *Pr.886* setting, set a smaller value in *Pr.665*.	○	○	○
		665	Regeneration avoidance frequency gain	0.1%	100%	0 to 200%		○	○	○
Free parameter	888		Free parameter 1	1	9999	0 to 9999	Parameters you can use for your own purposes. Used for maintenance, management, etc. by setting a unique number to each inverter when multiple inverters are used. Data is held even if the inverter power is turned off.	○	×	×
	889		Free parameter 2	1	9999	0 to 9999		○	×	×
—	891		Refer to *Pr. 52*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Energy saving monitor	892		Load factor	0.1%	100%	30 to 150%	Set the load factor for commercial power supply operation. This value is used to calculate the power consumption estimated value during commercial power supply operation.	○	○	○
	893		Energy saving monitor reference (motor capacity)	0.01/ 0.1kW *	Inverter rated capacity	0.1 to 55/ 0 to 3600kW *	Set the motor capacity (pump capacity). Set when calculating power saving rate and average power saving rate value. * The increments and setting range differ according to the inverter capacity. (55K or lower/75k or higher)	○	○	○
	894		Control selection during commercial power-supply operation	1	0	0	Discharge damper control (fan)	○	○	○
						1	Inlet damper control (fan)			
						2	Valve control (pump)			
						3	Commercial power-supply drive (fixed value)			
	895		Power saving rate reference value	1	9999	0	Consider the value during commercial power-supply operation as 100%	○	○	○
						1	Consider the *Pr. 893* setting as 100%.			
						9999	No function			
	896		Power unit cost	0.01	9999	0 to 500	Set the power unit cost. Displays the power saving rate on the energy saving monitor	○	○	○
						9999	No function			
	897		Power saving monitor average time	1h	9999	0	Average for 30 minutes	○	○	○
						1 to 1000h	Average for the set time			
						9999	No function			
	898		Power saving cumulative monitor clear	1	9999	0	Cumulative monitor value clear	○	×	○
						1	Cumulative monitor value hold			
						10	Cumulative monitor continue (communication data upper limit 9999)			
						9999	Cumulative monitor continue (communication data upper limit 65535)			
	899		Operation time rate (estimated value)	0.1%	9999	0 to 100%	Use for calculation of annual power saving amount. Set the annual operation ratio (consider 365 days × 24h as 100%).	○	○	○
						9999	No function			
Adjustment of terminal FM and AM (calibration)	C0 (900)		FM terminal calibration	–	–	–	Calibrate the scale of the meter connected to terminal FM. (Only when *Pr. 291* = 0, 1)	○	×	○
	C1 (901)		AM terminal calibration	–	–	–	Calibrate the scale of the analog meter connected to terminal AM.	○	×	○
—	C2(902) to C7(905)		Refer to *Pr. 125 and Pr. 126*.							

Function	Parameter	Related parameters	Name	Increments	Initial Value	Range	Description	Parameter copy	Parameter clear	All parameter clear
								○: enabled ×: disabled		
Adjustment of analog input speed limit (calibration)	C12 (917)		Terminal 1 bias frequency (speed)	0.01Hz	0Hz	0 to 400Hz	Set the frequency on the bias side of terminal 1 input. (valid when *Pr.868* = 5)	○	×	○
	C13 (917)		Terminal 1 bias (speed)	0.1%	0%	0 to 300%	Set the converted % of the bias side voltage (current) of terminal 1 input. (valid when *Pr.868* = 5)	○	×	○
	C14 (918)		Terminal 1 gain frequency (speed)	0.01Hz	60Hz	0 to 400Hz	Set the frequency of terminal 1 input gain (maximum). (valid when *Pr.868* = 5)	○	×	○
	C15 (918)		Terminal 1 gain (speed)	0.1%	100%	0 to 300%	Set the converted % of the gain side voltage (current) of terminal 1 input. (valid when *Pr.868* = 5)	○	×	○
Adjustment of analog input torque magnetic flux command (calibration)	C16 (919)		Terminal 1 bias command (torque/ magnetic flux)	0.1%	0%	0 to 400%	Set the torque/magnetic flux command value on the bias side of terminal 1 input. (valid when *Pr. 868* ≠ 0, 5)	○	×	○
	C17 (919)		Terminal 1 bias (torque/magnetic flux)	0.1%	0%	0 to 300%	Set the converted % of the bias side voltage (current) of terminal 1 input. (valid when *Pr. 868* ≠ 0, 5)	○	×	○
	C18 (920)		Terminal 1 gain command (torque/ magnetic flux)	0.1%	150%	0 to 400%	Set the torque/magnetic flux command value on the gain side of terminal 1 input. (valid when *Pr. 868* ≠ 0, 5)	○	×	○
	C19 (920)		Terminal 1 gain (torque/magnetic flux)	0.1%	100%	0 to 300%	Set the converted % of the gain side voltage (current) of terminal 1 input. (valid when *Pr. 868* ≠ 0, 5)	○	×	○
	C38 (932)		Terminal 4 bias command (torque/ magnetic flux)	0.1%	0%	0 to 400%	Set the torque/magnetic flux command value on the bias side of terminal 4 input. (valid when *Pr. 858* = 1, 4)	○	×	○
	C39 (932)		Terminal 4 bias (torque/magnetic flux)	0.1%	20%	0 to 300%	Set the converted % of the bias side current (voltage) of terminal 4 input. (valid when *Pr. 858* = 1, 4)	○	×	○
	C40 (933)		Terminal 4 gain command (torque/ magnetic flux)	0.1%	150%	0 to 400%	Set the torque/magnetic flux command value on the bias side of terminal 4 input. (valid when *Pr. 858* = 1, 4)	○	×	○
	C41 (933)		Terminal 4 gain (torque/magnetic flux)	0.1%	100%	0 to 300%	Set the converted % of the gain side current (voltage) of terminal 4 input. (valid when *Pr. 858* = 1, 4)	○	×	○
—	989		Parameter copy alarm release	1	10/100 *	10, 100	Parameters for alarm release at parameter copy * The initial value differs according to the inverter capacity. (55K or lower/75k or higher)	○	×	○
Buzzer control of the operation panel	990		PU buzzer control	1	1	0	Without buzzer	○	○	○
						1	With buzzer			
PU contrast adjustment	991		PU contrast adjustment	1	58	0 to 63	Contrast adjustment of the LCD of the parameter unit (FR-PU04/FR-PU07) can be performed. 0 (Light) → 63 (Dark)	○	×	○
Parameter clear, parameter copy	Pr.CL		Parameter clear	1	0	0, 1	Setting "1" returns all parameters except calibration parameters to the initial values.			
	ALLC		All parameter clear	1	0	0, 1	Setting "1" returns all parameters to the initial values.			
	Er.CL		Faults history clear	1	0	0, 1	Setting "1" will clear eight past faults.			
	PCPY		Parameter copy	1	0	0	Cancel			
						1	Read the source parameters to the operation panel.			
						2	Write the parameters copied to the operation panel to the destination inverter.			
						3	Verify parameters in the inverter and operation panel.			

The parameter number in parentheses is the one for use with the parameter unit (FR-PU04/FR-PU07).

4 TROUBLESHOOTING

When a fault occurs in the inverter, the inverter trips and the PU display automatically changes to one of the following fault or alarm indications.
If the fault does not correspond to any of the following faults or if you have any other problem, please contact your sales representative.

- Retention of fault output signal ..... When the magnetic contactor (MC) provided on the input side of the inverter is opened when a fault occurs, the inverter's control power will be lost and the fault output will not be held.
- Fault or alarm indication ..... When a fault or alarm occurs, the operation panel display automatically switches to the fault or alarm indication
- Resetting method..... When a fault occurs, the inverter output is kept stopped. Unless reset, therefore, the inverter cannot restart. *(Refer to page 137.)*
- When any fault occurs, take the appropriate corrective action, then reset the inverter, and resume operation. Not doing so may lead to the inverter fault and damage.

Inverter fault or alarm indications are roughly categorized as below.

(1) Error message
A message regarding operational fault and setting fault by the operation panel (FR-DU07) and parameter unit (FR-PU04 /FR-PU07) is displayed. The inverter does not trip.

(2) Warning
The inverter does not trip even when a warning is displayed. However, failure to take appropriate measures will lead to a fault.

(3) Alarm
The inverter does not trip. You can also output an alarm signal by making parameter setting.

(4) Fault
When a fault occurs, the inverter trips and a fault signal is output.

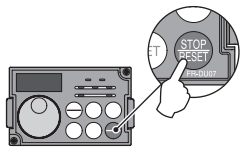
REMARKS

· Past eight faults can be displayed using the setting dial. (*Refer to page 154* for the operation.)

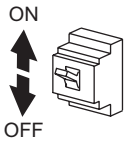
4.1 Reset method of protective function

The inverter can be reset by performing any of the following operations. Note that the internal thermal integrated value of the electronic thermal relay function and the number of retries are cleared (erased) by resetting the inverter.
Inverter recovers about 1s after the reset is released.

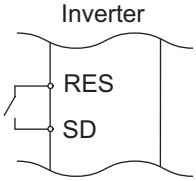
Operation 1: ..... Using the operation panel, press STOP RESET to reset the inverter.
(This may only be performed when a fault occurs. (Refer to *page 143* for fault.))



Operation 2: ..... Switch power OFF once, then switch it ON again.



Operation 3: ..... Turn ON the reset signal (RES) for more than 0.1s. (If the RES signal is kept ON, "Err." appears (flickers) to indicate that the inverter is in a reset status.)



CAUTION

· OFF status of the start signal must be confirmed before resetting the inverter fault. Resetting inverter fault with the start signal ON restarts the motor suddenly.

4.2 List of fault or alarm display

Operation Panel Indication			Name	Refer to
Error message	E - - -	E - - -	Faults history	154
	HOLd	HOLD	Operation panel lock	139
	LOCd	LOCD	Password locked	139
	Er1 to Er4	Er1 to 4	Parameter write error	139
	rE1 to rE4	rE1 to 4	Copy operation error	140
	Err.	Err.	Error	140
Warning	OL	OL	Stall prevention (overcurrent)	141
	oL	oL	Stall prevention (overvoltage)	141
	rb	RB	Regenerative brake prealarm	142
	TH	TH	Electronic thermal relay function prealarm	142
	PS	PS	PU stop	141
	MT	MT	Maintenance signal output	142
	CP	CP	Parameter copy	142
	SL	SL	Speed limit indication (Output during speed limit)	142
Alarm	Fn	FN	Fan alarm	143
Fault	E.OC1	E.OC1	Overcurrent trip during acceleration	143
	E.OC2	E.OC2	Overcurrent trip during constant speed	143
	E.OC3	E.OC3	Overcurrent trip during deceleration or stop	144
	E.Ov1	E.OV1	Regenerative overvoltage trip during acceleration	144
	E.Ov2	E.OV2	Regenerative overvoltage trip during constant speed	144
	E.Ov3	E.OV3	Regenerative overvoltage trip during deceleration or stop	144
	E.THT	E.THT	Inverter overload trip (electronic thermal relay function)	145
	E.THM	E.THM	Motor overload trip (electronic thermal relay function)	145
	E.FIn	E.FIN	Heatsink overheat	145
	E.IPF	E.IPF	Instantaneous power failure	145
	E. bE	E.BE	Brake transistor alarm detection	146
	E.UvT	E.UVT	Undervoltage	146
	E.ILF	E.ILF*	Input phase loss	146
	E.OLT	E.OLT	Stall prevention stop	146

Operation Panel Indication			Name	Refer to
Fault	E. GF	E.GF	Output side earth (ground) fault overcurrent	146
	E. LF	E.LF	Output phase loss	147
	E.OHT	E.OHT	External thermal relay operation *2	147
	E.PTC	E.PTC*	PTC thermistor operation	147
	E.OPT	E.OPT	Option fault	147
	E.OP3	E.OP3	Communication option fault	148
	E. 1 to E. 3	E. 1 to E. 3	Option fault	148
	E. PE	E.PE	Parameter storage device fault	148
	E.PUE	E.PUE	PU disconnection	148
	E.rET	E.RET	Retry count excess	149
	E.PE2	E.PE2*	Parameter storage device fault	148
	E. 5 to E. 7 E.CPU	E. 5 to E. 7 E.CPU	CPU fault	149
	E.CTE	E.CTE	Operation panel power supply short circuit, RS-485 terminal power supply short circuit	149
	E.P24	E.P24	24VDC power output short circuit	151
	E.CdO	E.CDO*	Output current detection value exceeded	151
	E.IOH	E.IOH*	Inrush current limit circuit fault	151
	E.SER	E.SER*	Communication fault (inverter)	151
	E.AIE	E.AIE*	Analog input fault	151
	E. OS	E.OS	Overspeed occurrence	149
	E.OSd	E.OSD	Speed deviation excess detection	150
	E.ECT	E.ECT	Signal loss detection	150
	E. Od	E.OD	Excessive position fault	150
	E.MB1 to E.MB7	E.MB1 to E.MB7	Brake sequence fault	149
	E.EP	E.EP	Encoder phase fault	150
	E.USb	E.USB*	USB communication fault	151
	E. 11	E.11	Opposite rotation deceleration fault	152
	E. 13	E.13	Internal circuit fault	152

* If a fault occurs when using the FR-PU04, "Fault 14" is displayed on the FR-PU04.

4.3 Causes and corrective actions

(1) Error message

A message regarding operational troubles is displayed. Output is not shut off.

Operation Panel Indication	HOLD	HOLd
Name	Operation panel lock	
Description	Operation lock mode is set. Operation other than STOP RESET is invalid. *(Refer to page 51.)*	
Check point	—	
Corrective action	Press MODE for 2s to release lock.	

Operation Panel Indication	LOCD	LOCd
Name	Password locked	
Description	Password function is active. Display and setting of parameter is restricted.	
Check point	—	
Corrective action	Enter the password in *Pr. 297 Password lock/unlock* to unlock the password function before operating. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*	

Operation Panel Indication	Er1	Er 1
Name	Write disable error	
Description	· You attempted to make parameter setting when *Pr. 77 Parameter write selection* has been set to disable parameter write. · Frequency jump setting range overlapped. · Adjustable 5 points V/F settings overlapped · The PU and inverter cannot make normal communication	
Check point	· Check the setting of *Pr. 77 Parameter write selection (Refer to Chapter 4 of the Instruction Manual (Applied).)* · Check the settings of *Pr. 31 to 36 (frequency jump). (Refer to Chapter 4 of the Instruction Manual (Applied).)* · Check the settings of *Pr. 100 to Pr. 109 (adjustable 5 points V/F). (Refer to Chapter 4 of the Instruction Manual (Applied).)* · Check the connection of the PU and inverter.	

Operation Panel Indication	Er2	Er2
Name	Write error during operation	
Description	When parameter write was performed during operation with a value other than "2" (writing is enabled independently of operating status in any operation mode) is set in *Pr. 77* and the STF (STR) is ON.	
Check point	· Check the *Pr. 77* setting. *(Refer to Chapter 4 of the Instruction Manual (Applied).)* · Check that the inverter is not operating.	
Corrective action	· Set "2" in *Pr. 77*. · After stopping operation, make parameter setting.	

Operation Panel Indication	Er3	Er3
Name	Calibration error	
Description	Analog input bias and gain calibration values are too close.	
Check point	Check the settings of C3, C4, C6 and C7 (calibration functions). *(Refer to Chapter 4 of the Instruction Manual (Applied).)*	

Operation Panel Indication	Er4	Er4
Name	Mode designation error	
Description	· Appears if a parameter setting is attempted in the External or NET operation mode with *Pr. 77* ≠ "2". · Appears if a parameter setting is attempted when the command source is not at the operation panel. (FR-DU07).	
Check point	· Check that operation mode is "PU operation mode". · Check the *Pr. 77* setting. *(Refer to Chapter 4 of the Instruction Manual (Applied).)* · Check the *Pr. 551* setting.	
Corrective action	· After setting the operation mode to the "PU operation mode", make parameter setting. *(Refer to page 62.)* · After setting *Pr. 77* = "2", make parameter setting. · Set *Pr.551* = "2 (initial setting)". *(Refer to Chapter 4 of the Instruction Manual (Applied).)*	

Operation Panel Indication	rE1	rE1
Name	Parameter read error	
Description	An error occurred in the EEPROM on the operation panel side during parameter copy reading.	
Check point	—	
Corrective action	· Make parameter copy again. *(Refer to page 55.)* · Check for an operation panel (FR-DU07) failure. Please contact your sales representative.	

Operation Panel Indication	rE2	rE2
Name	Parameter write error	
Description	· You attempted to perform parameter copy write during operation. · An error occurred in the EEPROM on the operation panel side during parameter copy writing.	
Check point	Is the FWD or REV LED of the operation panel (FR-DU07) lit or flickering?	
Corrective action	· After stopping operation, make parameter copy again. *(Refer to page 55.)* · Check for an operation panel (FR-DU07) failure. Please contact your sales representative.	

Operation Panel Indication	rE3	rE3
Name	Parameter verification error	
Description	· Data on the operation panel side and inverter side are different. · An error occurred in the EEPROM on the operation panel side during parameter verification.	
Check point	Check for the parameter setting of the source inverter and inverter to be verified.	
Corrective action	· Press SET to continue verification. Make parameter verification again. *(Refer to page 56.)* · Check for an operation panel (FR-DU07) failure. Please contact your sales representative.	

Operation Panel Indication	rE4	rE4
Name	Model error	
Description	· A different model was used for parameter write and verification during parameter copy. · When parameter copy write is stopped after parameter copy read is stopped	
Check point	· Check that the verified inverter is the same model. · Check that the power is not turned OFF or an operation panel is not disconnected, etc. during parameter copy read.	
Corrective action	· Use the same model (FR-A700 series) for parameter copy and verification. · Perform parameter copy read again.	

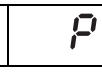
Operation Panel Indication	Err.	Err.
Description	· The RES signal is on · The PU and inverter cannot make normal communication (contact fault of the connector) · When the voltage drops in the inverter's input side. · When the control circuit power (R1/L11, S1/L21) and the main circuit power (R/L1, S/L2, T/L3) are connected to a separate power, it may appear at turning ON of the main circuit. It is not a fault.	
Corrective action	· Turn OFF the RES signal. · Check the connection of the PU and inverter. · Check the voltage on the inverter's input side.	

(2) Warning

When the protective function is activated, the output is not shut off.

Operation Panel Indication	OL		FR-PU04 FR-PU07	OL
Name	Stall prevention (overcurrent)			
Description	During acceleration	When the output current (output torque during Real sensorless vector control or vector control) of the inverter exceeds the stall prevention operation level (*Pr. 22 Stall prevention operation level*, etc.), this function stops the increase in frequency until the overload current decreases to prevent the inverter from resulting in overcurrent trip. When the overload current has decreased below stall prevention operation level, this function increases the frequency again.		
	During constant speed operation	When the output current (output torque during Real sensorless vector control or vector control) of the inverter exceeds the stall prevention operation level (*Pr. 22 Stall prevention operation level*, etc.), this function reduces frequency until the overload current decreases to prevent the inverter from resulting in overcurrent trip. When the overload current has decreased below stall prevention operation level, this function increases the frequency up to the set value.		
	During deceleration	When the output current (output torque during Real sensorless vector control or vector control) of the inverter exceeds the stall prevention operation level (*Pr. 22 Stall prevention operation level*, etc.), this function stops the decrease in frequency until the overload current decreases to prevent the inverter from resulting in overcurrent trip. When the overload current has decreased below stall prevention operation level, this function decreases the frequency again.		
Check point	· Check that the *Pr. 0 Torque boost* setting is not too large. · Check that the *Pr. 7 Acceleration time* and *Pr. 8 Deceleration time* settings are not too small. · Check that the load is not too heavy. · Are there any failure in peripheral devices? · Check that the *Pr. 13 Starting frequency* is not too large. · Check the motor for use under overload. · Check that *Pr. 22 Stall prevention operation level* is appropriate.			
Corrective action	· Increase or decrease the *Pr. 0 Torque boost* value 1% by 1% and check the motor status. *(Refer to page 59.)* · Set a larger value in *Pr. 7 Acceleration time* and *Pr. 8 Deceleration time*. *(Refer to page 60.)* · Reduce the load weight. · Try Advanced magnetic flux vector control, Real sensorless vector control or vector control. · Change the *Pr. 14 Load pattern selection* setting. · Set stall prevention operation current in *Pr. 22 Stall prevention operation level*. (The initial value is 150%.) The acceleration/deceleration time may change. Increase the stall prevention operation level with *Pr. 22 Stall prevention operation level*, or disable stall prevention with *Pr. 156 Stall prevention operation selection*. (Use *Pr. 156* to set either operation continued or not at OL operation.)			

Operation Panel Indication	oL		FR-PU04 FR-PU07	oL
Name	Stall prevention (overvoltage)			
Description	During deceleration	· If the regenerative energy of the motor becomes excessive and exceeds the regenerative energy consumption capability, this function stops the decrease in frequency to prevent overvoltage trip. As soon as the regenerative energy has decreased, deceleration resumes. · If the regenerative energy of the motor becomes excessive when regeneration avoidance function is selected (*Pr. 882* = 1), this function increases the speed to prevent overvoltage trip. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*		
Check point	· Check for sudden speed reduction. · Regeneration avoidance function *(Pr. 882 to Pr. 886)* is being used? *(Refer to Chapter 4 of the Instruction Manual (Applied).)*			
Corrective action	The deceleration time may change. Increase the deceleration time using *Pr. 8 Deceleration time*.			

Operation Panel Indication	PS		FR-PU04 FR-PU07	PS
Name	PU stop			
Description	Stop with STOP RESET of the PU is set in *Pr. 75 Reset selection/disconnected PU detection/PU stop selection*. (For *Pr. 75*, refer to *Chapter 4 of the Instruction Manual (Applied)*.)			
Check point	Check for a stop made by pressing STOP RESET of the operation panel.			
Corrective action	Turn the start signal OFF and release with PU EXT.			

Operation Panel Indication	RB	rb	FR-PU04 / FR-PU07	RB
Name	Regenerative brake prealarm			
Description	Appears if the regenerative brake duty reaches or exceeds 85% of the *Pr. 70 Special regenerative brake duty* value. When the setting of *Pr. 70 Special regenerative brake duty* is the initial value (*Pr. 70* = "0"), this warning does not occur. If the regenerative brake duty reaches 100%, a regenerative overvoltage (E. OV_) occurs. The RBP signal can be simultaneously output with the [RB] display. For the terminal used for the RBP signal output, assign the function by setting "7" (positive logic) or "107" (negative logic) in any of *Pr. 190 to Pr. 196 (output terminal function selection)*. *(Refer to Chapter 4 of the Instruction Manual (Applied))*			
Check point	· Check that the brake resistor duty is not high. · Check that the *Pr. 30 Regenerative function selection* and *Pr. 70 Special regenerative brake duty* values are correct.			
Corrective action	· Increase the deceleration time. · Check the *Pr. 30 Regenerative function selection* and *Pr. 70 Special regenerative brake duty* values.			

Operation Panel Indication	TH	TH	FR-PU04 / FR-PU07	TH
Name	Electronic thermal relay function prealarm			
Description	Appears if the cumulative value of the *Pr. 9 Electronic thermal O/L relay* reaches or exceeds 85% of the preset level. If it reaches 100% of the *Pr. 9 Electronic thermal O/L relay* setting, a motor overload trip (E. THM) occurs. The THP signal can be simultaneously output with the [TH] display. For the terminal used for the THP signal output, assign the function by setting "8" (positive logic) or "108" (negative logic) in any of *Pr. 190 to Pr. 196 (output terminal function selection)*. *(Refer to Chapter 4 of the Instruction Manual (Applied))*			
Check point	· Check for large load or sudden acceleration. · Is the *Pr. 9 Electronic thermal O/L relay* setting is appropriate? *(Refer to page 58.)*			
Corrective action	· Reduce the load weight or the number of operation times. · Set an appropriate value in *Pr. 9 Electronic thermal O/L relay*. *(Refer to page 58.)*			

Operation Panel Indication	MT	MT	FR-PU04	———
			FR-PU07	MT
Name	Maintenance signal output			
Description	Indicates that the cumulative energization time of the inverter has reached a given time. When the setting of *Pr. 504 Maintenance timer alarm output set time* is the initial value (*Pr. 504* = "9999"), this warning does not occur.			
Check point	The *Pr. 503 Maintenance timer* setting is larger than the *Pr. 504 Maintenance timer alarm output set time* setting. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*			
Corrective action	Setting "0" in *Pr. 503 Maintenance timer* erases the signal.			

Operation Panel Indication	CP	CP	FR-PU04	———
			FR-PU07	CP
Name	Parameter copy			
Description	Appears when parameters are copied between models with capacities of 55K or lower and 75K or higher.			
Check point	Resetting of *Pr. 9, Pr. 30, Pr. 51, Pr. 52, Pr. 54, Pr. 56, Pr. 57, Pr. 61, Pr. 70, Pr. 72, Pr. 80, Pr. 82, Pr. 90 to Pr. 94, Pr. 158, Pr. 455, Pr. 458 to Pr. 462, Pr. 557, Pr. 859, Pr. 860* and *Pr. 893* is necessary.			
Corrective action	Set the initial value in *Pr. 989 Parameter copy alarm release*.			

Operation Panel Indication	SL	SL	FR-PU04	———
			FR-PU07	SL
Name	Speed limit indication (output during speed limit)			
Description	Output if the speed limit level is exceeded during torque control.			
Check point	· Check that the torque command is not larger than required. · Check that the speed limit level is not low.			
Corrective action	· Decrease the torque command. · Increase the speed limit level.			

(3) Alarm

When an alarm occurs, the output is not shut off. You can also output an alarm signal by making parameter setting. (Set "98" in any of *Pr. 190 to Pr. 196 (output terminal function selection)*. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*)

Operation Panel Indication	FN	FN	FR-PU04 FR-PU07	FN
Name	Fan alarm			
Description	For the inverter that contains a cooling fan, FN appears on the operation panel when the cooling fan stops due to a fault or different operation from the setting of *Pr. 244 Cooling fan operation selection*.			
Check point	Check the cooling fan for a fault.			
Corrective action	Check for fan fault. Please contact your sales representative.			

(4) Fault

When a fault occurs, the inverter trips and a fault signal is output.

Operation Panel Indication	E.OC1	E.OC1	FR-PU04 FR-PU07	OC During Acc
Name	Overcurrent trip during acceleration			
Description	When the inverter output current reaches or exceeds approximately 220% of the rated current during acceleration, the protective circuit is activated to stop the inverter output.			
Check point	· Check for sudden acceleration. · Check that the downward acceleration time is not long in vertical lift application. · Check for output short circuit. · Check that the *Pr. 3 Base frequency* setting is not 60Hz when the motor rated frequency is 50Hz. · Check if the stall prevention operation level is set too high. Check if the fast-response current limit operation is disabled. · Check that the regeneration is not performed frequently. (Check that the output voltage becomes larger than the V/F reference voltage at regeneration and overcurrent occurs due to the high voltage.) · Check that the power supply for RS-485 terminal is not shorted. (under vector control) · Check that the rotation direction is not switched from forward to reverse rotation (or from reverse to forward) during torque control under Real sensorless vector control.			
Corrective action	· Increase the acceleration time. (Shorten the downward acceleration time in vertical lift application.) · When "E.OC1" is always lit at starting, disconnect the motor once and start the inverter. If "E.OC1" is still lit, contact your sales representative. · Check the wiring to make sure that output short circuit does not occur. · Set the *Pr. 3 Base frequency* to 50Hz. *(Refer to page 58.)* · Lower the setting of stall prevention operation level. Activate the fast-response current limit operation.*(Refer to Chapter 4 of the Instruction Manual (Applied).)* · Set base voltage (rated voltage of the motor, etc.) in *Pr. 19 Base frequency voltage*. *(Refer to Chapter 4 of the Instruction Manual (Applied).)* · Check RS-485 terminal connection. (under vector control) · Prevent the motor from switching the rotation direction from forward to reverse (or from reverse to forward) during torque control under Real sensorless vector control.			

Operation Panel Indication	E.OC2	E.OC2	FR-PU04 FR-PU07	Stedy Spd OC
Name	Overcurrent trip during constant speed			
Description	When the inverter output current reaches or exceeds approximately 220% of the rated current during constant speed operation, the protective circuit is activated to stop the inverter output.			
Check point	· Check for sudden load change. · Check for output short circuit. · Check if the stall prevention operation level is set too high. Check if the fast-response current limit operation is disabled. · Check that the power supply for RS-485 terminal is not shorted. (under vector control) · Check that the rotation direction is not switched from forward to reverse rotation (or from reverse to forward) during torque control under Real sensorless vector control.			
Corrective action	· Keep load stable. · Check the wiring to make sure that output short circuit does not occur. · Lower the setting of stall prevention operation level. Activate the fast-response current limit operation.*(Refer to Chapter 4 of the Instruction Manual (Applied).)* · Check RS-485 terminal connection. (under vector control) · Prevent the motor from switching the rotation direction from forward to reverse (or from reverse to forward) during torque control under Real sensorless vector control.			

Operation Panel Indication	E.OC3	E.OC3	FR-PU04 FR-PU07	OC During Dec
Name	Overcurrent trip during deceleration or stop			
Description	When the inverter output current reaches or exceeds approximately 220% of the rated inverter current during deceleration (other than acceleration or constant speed), the protective circuit is activated to stop the inverter output.			
Check point	· Check for sudden speed reduction. · Check for output short circuit. · Check for too fast operation of the motor's mechanical brake. · Check if the stall prevention operation level is set too high. Check if the fast-response current limit operation is disabled. · Check that the power supply for RS-485 terminal is not shorted. (under vector control) · Check that the rotation direction is not switched from forward to reverse rotation (or from reverse to forward) during torque control under Real sensorless vector control.			
Corrective action	· Increase the deceleration time. · Check the wiring to make sure that output short circuit does not occur. · Check the mechanical brake operation. · Lower the setting of stall prevention operation level. Activate the fast-response current limit operation. *(Refer to Chapter 4 of 🕮 the Instruction Manual (Applied).)* · Check RS-485 terminal connection. (under vector control) · Prevent the motor from switching the rotation direction from forward to reverse (or from reverse to forward) during torque control under Real sensorless vector control.			

Operation Panel Indication	E.OV1	E.OV1	FR-PU04 FR-PU07	OV During Acc
Name	Regenerative overvoltage trip during acceleration			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system.			
Check point	· Check for too slow acceleration. (e.g. during descending acceleration in vertical lift load) · Check that the *Pr. 22 Stall prevention operation level* is not lower than the no load current.			
Corrective action	· Decrease the acceleration time. · Use regeneration avoidance function *(Pr. 882 to Pr. 886). (Refer to Chapter 4 of 🕮 the Instruction Manual (Applied).)* · Set a value larger than the no load current in *Pr. 22 Stall prevention operation level*.			

Operation Panel Indication	E.OV2	E.OV2	FR-PU04 FR-PU07	Stedy Spd OV
Name	Regenerative overvoltage trip during constant speed			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system.			
Check point	· Check for sudden load change. · Check that the *Pr. 22 Stall prevention operation level* is not lower than the no load current.			
Corrective action	· Keep load stable. · Use regeneration avoidance function *(Pr. 882 to Pr. 886). (Refer to Chapter 4 of 🕮 the Instruction Manual (Applied).)* · Use the brake unit or power regeneration common converter (FR-CV) as required. · Set a value larger than the no load current in *Pr. 22 Stall prevention operation level*.			

Operation Panel Indication	E.OV3	E.OV3	FR-PU04 FR-PU07	OV During Dec
Name	Regenerative overvoltage trip during deceleration or stop			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system.			
Check point	Check for sudden speed reduction.			
Corrective action	· Increase the deceleration time. (Set the deceleration time which matches the moment of inertia of the load) · Longer the brake cycle. · Use regeneration avoidance function *(Pr. 882 to Pr. 886). (Refer to Chapter 4 of 🕮 the Instruction Manual (Applied).)* · Use the brake unit or power regeneration common converter (FR-CV) as required.			

Operation Panel Indication	E.THT	E.THT	FR-PU04 FR-PU07	Inv. Ovrload
Name	Inverter overload trip (electronic thermal relay function) *1			
Description	If a current not less than 150% of the rated output current flows and overcurrent trip does not occur (220% or less), the electronic thermal relay activates to stop the inverter output in order to protect the output transistors. (Overload capacity 150% 60s, inverse-time characteristic)			
Check point	· Check that acceleration/deceleration time is not too short. · Check that torque boost setting is not too large (small). · Check that load pattern selection setting is appropriate for the load pattern of the using machine. · Check the motor for use under overload.			
Corrective action	· Increase acceleration/deceleration time. · Adjust the torque boost setting. · Set the load pattern selection setting according to the load pattern of the using machine. · Reduce the load weight.			

Operation Panel Indication	E.THM	E.THM	FR-PU04 FR-PU07	Motor Ovrload
Name	Motor overload trip (electronic thermal relay function) *1			
Description	The electronic thermal relay function in the inverter detects motor overheat due to overload or reduced cooling capability during constant-speed operation and pre-alarm (TH display) is output when the integrated value reaches 85% of the *Pr. 9 Electronic thermal O/L relay* setting and the protection circuit is activated to stop the inverter output when the integrated value reaches the specified value. When running a special motor such as a multi-pole motor or multiple motors, provide a thermal relay on the inverter output side since such motor(s) cannot be protected by the electronic thermal relay function.			
Check point	· Check the motor for use under overload. · Check that the setting of *Pr. 71 Applied motor* for motor selection is correct. *(Refer to Chapter 4 of the Instruction Manual (Applied).)* · Check that stall prevention operation setting is correct.			
Corrective action	· Reduce the load weight. · For a constant-torque motor, set the constant-torque motor in *Pr. 71 Applied motor*. · Check that stall prevention operation setting is correct. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*			

*1 Resetting the inverter initializes the internal thermal integrated data of the electronic thermal relay function.

Operation Panel Indication	E.FIN	E.FIN	FR-PU04 FR-PU07	H/Sink O/Temp
Name	Heatsink overheat			
Description	If the heatsink overheats, the temperature sensor is actuated to stop the inverter output. The FIN signal can be output when the temperature becomes approximately 85% of the heatsink overheat protection operation temperature. For the terminal used for the FIN signal output, assign the function by setting "26" (positive logic) or "126" (negative logic) in any of *Pr. 190 to Pr. 196 (output terminal function selection)*. *(Refer to Chapter 4 of the Instruction Manual (Applied))*			
Check point	· Check for too high surrounding air temperature. · Check for heatsink clogging. · Check that the cooling fan is stopped. (Check that Fn is displayed on the operation panel.)			
Corrective action	· Set the surrounding air temperature to within the specifications. · Clean the heatsink. · Replace the cooling fan.			

Operation Panel Indication	E.IPF	E.IPF	FR-PU04 FR-PU07	Inst. Pwr. Loss
Name	Instantaneous power failure			
Description	If a power failure occurs for longer than 15ms (this also applies to inverter input shut-off), the instantaneous power failure protective function is activated to trip the inverter in order to prevent the control circuit from malfunctioning. If a power failure persists for longer than 100ms, the fault output is not provided, and the inverter restarts if the start signal is ON upon power restoration. (The inverter continues operating if an instantaneous power failure is within 15ms.) In some operating status (load magnitude, acceleration/deceleration time setting, etc.), overcurrent or other protection may be activated upon power restoration. When instantaneous power failure protection is activated, the IPF signal is output. *(Refer to Chapter 4 of the Instruction Manual (Applied))*			
Check point	Find the cause of instantaneous power failure occurrence.			
Corrective action	· Remedy the instantaneous power failure. · Prepare a backup power supply for instantaneous power failure. · Set the function of automatic restart after instantaneous power failure (*Pr. 57*). *(Refer to Chapter 4 of the Instruction Manual (Applied).)*			

Operation Panel Indication	E.BE	E. bE	FR-PU04 FR-PU07	Br. Cct. Fault
Name	Brake transistor alarm detection			
Description	This function stops the inverter output if an alarm occurs in the brake circuit, e.g. damaged brake transistors. In this case, the inverter must be powered OFF immediately.			
Check point	· Reduce the load inertia. · Check that the frequency of using the brake is proper.			
Corrective action	Replace the inverter.			

Operation Panel Indication	E.UVT	E.UuT	FR-PU04 FR-PU07	Under Voltage
Name	Undervoltage			
Description	If the power supply voltage of the inverter decreases, the control circuit will not perform normal functions. In addition, the motor torque will be insufficient and/or heat generation will increase. To prevent this, if the power supply voltage decreases below about 150VAC (300VAC for the 400V class), this function stops the inverter output. When a jumper is not connected across P/+ and P1, the undervoltage protective function is activated. When undervoltage protection is activated, the IPF signal is output. *(Refer to Chapter 4 of 🕮 the Instruction Manual (Applied))*			
Check point	· Check for start of large-capacity motor. · Check that a jumper or DC reactor is connected across terminals P/+ and P1.			
Corrective action	· Check the power supply system equipment such as the power supply. · Connect a jumper or DC reactor across terminals P/+ and P1. If the problem still persists after taking the above measure, please contact your sales representative.			

Operation Panel Indication	E.ILF	E.I LF	FR-PU04	Fault 14
			FR-PU07	Input phase loss
Name	Input phase loss			
Description	This fault is output when function valid setting (= 1) is set in *Pr. 872 Input phase loss protection selection* and one phase of the three phase power input is lost. When the setting of *Pr. 872 Input phase loss protection selection* is the initial value (*Pr. 872* = "0"), this fault does not occur. *(Refer to Chapter 4 of 🕮 the Instruction Manual (Applied).)*			
Check point	Check for a break in the cable for the three-phase power supply input.			
Corrective action	· Wire the cables properly. · Repair a break portion in the cable. · Check the *Pr. 872 Input phase loss protection selection* setting.			

Operation Panel Indication	E.OLT	E.OLT	FR-PU04 FR-PU07	Stll Prev STP
Name	Stall prevention stop			
Description	If the frequency has fallen to 0.5Hz by stall prevention operation and remains for 3s, a fault (E.OLT) appears and trips the inverter. OL appears while stall prevention is being activated. When speed control is performed by Real sensorless vector control or vector control, a fault (E.OLT) is displayed and the inverter output is stopped if frequency drops to the *Pr. 865 Low speed detection* (initial value is 1.5Hz) setting by torque limit operation and the output torque exceeds *Pr. 874 OLT level setting* (initial value is 150%) setting and remains for more than 3s.			
Check point	· Check the motor for use under overload. *(Refer to Chapter 4 of the Instruction Manual (Applied).)* · Check that the *Pr. 865 Low speed detection* and *Pr. 874 OLT level setting* values are correct. (Check the *Pr. 22 Stall prevention operation level* setting if V/F control is exercised.)			
Corrective action	· Reduce the load weight. · Change the *Pr. 22 Stall prevention operation level*, *Pr. 865 Low speed detection* and *Pr. 874 OLT level setting* values. (Check the *Pr. 22 Stall prevention operation level* setting if V/F control is exercised.)			

Operation Panel Indication	E.GF	E. GF	FR-PU04 FR-PU07	Ground Fault
Name	Output side earth (ground) fault overcurrent			
Description	This function stops the inverter output if an earth (ground) fault overcurrent flows due to an earth (ground) fault that occurred on the inverter's output (load) side.			
Check point	Check for an earth (ground) fault in the motor and connection cable.			
Corrective action	Remedy the earth (ground) fault portion.			

Operation Panel Indication	E.LF	E. LF	FR-PU04 FR-PU07	E.LF
Name	Output phase loss			
Description	This function stops the inverter output if one of the three phases (U, V, W) on the inverter's output side (load side) is lost.			
Check point	· Check the wiring (Check that the motor is normal.) · Check that the capacity of the motor used is not smaller than that of the inverter.			
Corrective action	· Wire the cables properly. · Choose inverter and motor capacities that match.			

Operation Panel Indication	E.OHT	E.OHT	FR-PU04 FR-PU07	OH Fault
Name	External thermal relay operation			
Description	If the external thermal relay provided for motor overheat protection, or the internally mounted temperature relay in the motor, etc. switches ON (contacts open), the inverter output is stopped. This function is available when "7" (OH signal) is set in any of *Pr. 178 to Pr. 189 (input terminal function selection)*. When the initial value (without OH signal assigned) is set, this protective function is not available.			
Check point	· Check for motor overheating. · Check that the value of 7 (OH signal) is set correctly in any of *Pr. 178 to Pr. 189 (input terminal function selection)*.			
Corrective action	· Reduce the load and operating duty. · Even if the relay contacts are reset automatically, the inverter will not restart unless it is reset.			

Operation Panel Indication	E.PTC	E.PTC	FR-PU04	Fault 14
			FR-PU07	PTC activated
Name	PTC thermistor operation			
Description	Stops the inverter output when the motor overheat status is detected for 10s or more by the external PTC thermistor input connected to the terminal AU. This fault is available when "63" is set in *Pr. 184 AU terminal function selection* and AU/PTC switchover switch is set in PTC side. When the initial value (*Pr. 184* = "4") is set, this protective function is not available.			
Check point	· Check the connection between the PTC thermistor switch and thermal protector. · Check the motor for operation under overload. · Is valid setting (= 63) selected in *Pr. 184 AU terminal function selection* ? *(Refer to Chapter 4 of 📖 the Instruction Manual (Applied).)*			
Corrective action	Reduce the load weight.			

Operation Panel Indication	E.OPT	E.OPT	FR-PU04 FR-PU07	Option Fault
Name	Option fault			
Description	· Appears when the AC power supply is connected to the terminal R/L1, S/L2, T/L3 accidentally when a high power factor converter is connected. · Appears when torque command by the plug-in option is selected using *Pr. 804 Torque command source selection* and no plug-in option is mounted. · Appears when the switch for the manufacturer setting of the plug-in option is changed. · Appears when a communication option is connected while *Pr. 296* = "0 or 100."			
Check point	· Check that the AC power supply is not connected to the terminal R/L1, S/L2, T/L3 when a high power factor converter (FR-HC, MT-HC) or power regeneration common converter (FR-CV) is connected. · Check that the plug-in option for torque command setting is connected. · Check for the password lock with a setting of *Pr. 296* = "0, 100"			
Corrective action	· Check the parameter (*Pr. 30*) setting and wiring. · The inverter may be damaged if the AC power supply is connected to the terminal R/L1, S/L2, T/L3 when a high power factor converter is connected. Please contact your sales representative. · Check for connection of the plug-in option. Check the *Pr. 804 Torque command source selection* setting. · Return the switch for the manufacturer setting of the plug-in option to the initial status. *(Refer to 📖 instruction manual of each option)* · To apply the password lock when installing a communication option, set *Pr.296* ≠ "0,100". *(Refer to Chapter 4 of 📖 the Instruction Manual (Applied).)*			

Operation Panel Indication	E.OP3	E.OP3	FR-PU04 FR-PU07	Option3 Fault
Name	Communication option fault			
Description	Stops the inverter output when a communication line error occurs in the communication option.			
Check point	· Check for a wrong option function setting and operation. · Check that the plug-in option is plugged into the connector securely. · Check for a break in the communication cable. · Check that the terminating resistor is fitted properly.			
Corrective action	· Check the option function setting, etc. · Connect the plug-in option securely. · Check the connection of communication cable.			

Operation Panel Indication	E. 1 to E. 3	E. 1 to E. 3	FR-PU04 FR-PU07	Fault 1 to Fault 3
Name	Option fault			
Description	Stops the inverter output if a contact fault, etc. of the connector between the inverter and plug-in option occurs or if a communication option is fitted to the connector 1 or 2. Appears when the switch for the manufacturer setting of the plug-in option is changed.			
Check point	· Check that the plug-in option is plugged into the connector securely. (1 to 3 indicate the option connector numbers.) · Check for excess electrical noises around the inverter. · Check that the communication option is not fitted to the connector 1 or 2.			
Corrective action	· Connect the plug-in option securely. · Take measures against noises if there are devices producing excess electrical noises around the inverter. If the problem still persists after taking the above measure, please contact your sales representative or distributor. · Fit the communication option to the connector 3. · Return the switch position for the manufacturer setting of the plug-in option to the initial status. *(Refer to 📖 instruction manual of each option)*			

Operation Panel Indication	E.PE	E.PE	FR-PU04 FR-PU07	Corrupt Memry
Name	Parameter storage device fault (control circuit board)			
Description	Stops the inverter output if fault occurred in the parameter stored. (EEPROM failure)			
Check point	Check for too many number of parameter write times.			
Corrective action	Please contact your sales representative. When performing parameter write frequently for communication purposes, set "1" in *Pr. 342* to enable RAM write. Note that powering OFF returns the inverter to the status before RAM write.			

Operation Panel Indication	E.PE2	E.PE2	FR-PU04	Fault 14
			FR-PU07	PR storage alarm
Name	Parameter storage device fault (main circuit board)			
Description	Stops the inverter output if fault occurred in the parameter stored. (EEPROM failure)			
Check point	————			
Corrective action	Please contact your sales representative.			

Operation Panel Indication	E.PUE	E.PUE	FR-PU04 FR-PU07	PU Leave Out
Name	PU disconnection			
Description	· This function stops the inverter output if communication between the inverter and PU is suspended, e.g. the operation panel and parameter unit is disconnected, when "2, 3, 16 or 17" was set in *Pr. 75 Reset selection/disconnected PU detection/PU stop selection*. · This function stops the inverter output when communication errors occurred consecutively for more than permissible number of retries when a value other than "9999" is set in *Pr. 121 Number of PU communication retries* during the RS-485 communication with the PU connector. · This function stops the inverter output if communication is broken within the period of time set in *Pr. 122 PU communication check time interval* during the RS-485 communication with the PU connector.			
Check point	· Check that the FR-DU07 or parameter unit (FR-PU04/FR-PU07) is connected properly. · Check the *Pr. 75* setting.			
Corrective action	Fit the FR-DU07 or parameter unit (FR-PU04/FR-PU07) securely.			

Operation Panel Indication	E.RET	E.rEr	FR-PU04 FR-PU07	Retry No Over
Name	Retry count excess			
Description	If operation cannot be resumed properly within the number of retries set, this function trips the inverter. This function is available only when *Pr. 67 Number of retries at fault occurrence* is set. When the initial value (*Pr. 67* = "0") is set, this fault does not occur.			
Check point	Find the cause of alarm occurrence.			
Corrective action	Eliminate the cause of the error preceding this error indication.			

Operation Panel Indication	E. 5	E. 5	FR-PU04 FR-PU07	Fault 5
	E. 6	E. 6		Fault 6
	E. 7	E. 7		Fault 7
	E.CPU	E.CPU		CPU Fault
Name	CPU fault			
Description	Stops the inverter output if the communication error of the built-in CPU occurs.			
Check point	Check for devices producing excess electrical noises around the inverter.			
Corrective action	· Take measures against noises if there are devices producing excess electrical noises around the inverter. · Please contact your sales representative.			

Operation Panel Indication	E.CTE	E.CtE	FR-PU04	——
			FR-PU07	E.CTE
Name	Operation panel power supply short circuit, RS-485 terminal power supply short circuit			
Description	When the operation panel power supply (PU connector) is shorted, this function shuts off the power output and stops the inverter. At this time, the operation panel (parameter unit) cannot be used and RS-485 communication from the PU connector cannot be made. When the internal power supply for RS-485 terminals are shorted, this function shuts off the power output. At this time, communication from the RS-485 terminals cannot be made. To reset, enter the RES signal or switch power OFF, then ON again.			
Check point	· Check for a short circuit in the PU connector cable. · Check that the RS-485 terminals are connected correctly.			
Corrective action	· Check the PU and cable. · Check the connection of the RS-485 terminals			

Operation Panel Indication	E.MB1 to 7	E.Mb1 to E.Mb7	FR-PU04	——
			FR-PU07	E.MB1 Fault to E.MB7 Fault
Name	Brake sequence fault			
Description	The inverter output is stopped when a sequence error occurs during use of the brake sequence function (*Pr. 278* to *Pr. 285*). This fault is not available in the initial status (brake sequence function is invalid). *(Refer to Chapter 4 of the Instruction Manual (Applied))*			
Check point	Find the cause of alarm occurrence.			
Corrective action	Check the set parameters and perform wiring properly.			

Operation Panel Indication	E.OS	E. 0S	FR-PU04 FR-PU07	E.OS
Name	Overspeed occurrence			
Description	Trips the inverter when the motor speed exceeds the *Pr. 374 Overspeed detection level* during encoder feedback control Real sensorless vector control and vector control. This fault is not available in the initial status.			
Check point	· Check that the *Pr. 374 Overspeed detection level* value is correct. · Check that the number of encoder pulses does not differ from the actual number of encoder pulses.			
Corrective action	· Set the *Pr. 374 Overspeed detection level* value correctly. · Set the correct number of encoder pulses in *Pr. 369 Number of encoder pulses*.			

Operation Panel Indication	E.OSD	E.OSd	FR-PU04 FR-PU07	E.OSd
Name	Speed deviation excess detection			
Description	Trips the inverter if the motor speed is increased or decreased under the influence of the load etc. during vector control with *Pr. 285 Excessive speed deviation detection frequency* set and cannot be controlled in accordance with the speed command value. This fault is not available in the initial status.			
Check point	· Check that the values of *Pr. 285 Excessive speed deviation detection frequency* and *Pr. 853 Speed deviation time* are correct. · Check for sudden load change. · Check that the number of encoder pulses does not differ from the actual number of encoder pulses.			
Corrective action	· Set *Pr. 285 Excessive speed deviation detection frequency* and *Pr. 853 Speed deviation time* correctly. · Keep load stable. · Set the correct number of encoder pulses in *Pr. 369 Number of encoder pulses*.			

Operation Panel Indication	E.ECT	E.ECT	FR-PU04 FR-PU07	E.ECT
Name	Signal loss detection			
Description	Trips the inverter when the encoder signal is shut off under orientation control, encoder feedback control or vector control. This fault is not available in the initial status.			
Check point	· Check for the encoder signal loss. · Check that the encoder specifications are correct. · Check for a loose connector. · Check that the switch setting of FR-A7AP/FR-A7AL (option) is correct. · Check that the power is supplied to the encoder. Or, check that the power is not supplied to the encoder later than the inverter. · Check that the voltage of the power supplied to the encoder is same as the encoder output voltage.			
Corrective action	· Remedy the signal loss. · Use an encoder that meets the specifications. · Make connection securely. · Make a switch setting of FR-A7AP/FR-A7AL (option) correctly. *(Refer to page 29)* · Supply the power to the encoder. Or supply the power to the encoder at the same time when the power is supplied to the inverter. If the power is supplied to the encoder after the inverter, check that the encoder signal is securely sent and set "0" in *Pr. 376*. · Make the voltage of the power supplied to the encoder the same as the encoder output voltage.			

Operation Panel Indication	E.OD	E. Od	FR-PU04 FR-PU07	Fault 14 E.Od
Name	Excessive position fault			
Description	Trips the inverter when the difference between the position command and position feedback exceeds *Pr. 427 Excessive level error* under position control. This fault is not available in the initial status.			
Check point	· Check that the position detecting encoder mounting orientation matches the parameter. · Check that the load is not large. · Check that the *Pr. 427 Excessive level error* and *Pr. 369 Number of encoder pulses* are correct.			
Corrective action	· Check the parameters. · Reduce the load weight. · Set the *Pr. 427 Excessive level error* and *Pr. 369 Number of encoder pulses* correctly.			

Operation Panel Indication	E.EP	E.EP	FR-PU04 FR-PU07	Fault 14 E.EP
Name	Encoder phase fault			
Description	Trips the inverter when the rotation command of the inverter differs from the actual motor rotation direction detected from the encoder. This fault is not available in the initial status.			
Check point	· Check for mis-wiring of the encoder cable. · Check for wrong setting of *Pr. 359 Encoder rotation direction*.			
Corrective action	· Perform connection and wiring securely. · Change the *Pr. 359 Encoder rotation direction* value.			

Operation Panel Indication	E.P24	EP24	FR-PU04 FR-PU07	E.P24
Name	24VDC power output short circuit			
Description	When the 24VDC power output from the PC terminal is shorted, this function shuts off the power output. At this time, all external contact inputs switch OFF. The inverter cannot be reset by entering the RES signal. To reset it, use the operation panel or switch power OFF, then ON again.			
Check point	· Check for a short circuit in the PC terminal output.			
Corrective action	· Remedy the earth (ground) fault portion.			

Operation Panel Indication	E.CDO	ECdO	FR-PU04	Fault 14
			FR-PU07	OC detect level
Name	Output current detection value exceeded			
Description	Trips the inverter when the output current exceeds the setting of *Pr. 150 Output current detection level*. This function is available when *Pr. 167 Output current detection operation selection* is set to "1". When the initial value (*Pr. 167* = "0") is set, this protective function is not available.			
Check point	Check the settings of *Pr. 150 Output current detection level*, *Pr. 151 Output current detection signal delay time*, *Pr. 166 Output current detection signal retention time*, *Pr. 167 Output current detection operation selection*. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*			

Operation Panel Indication	E.IOH	EI OH	FR-PU04	Fault 14
			FR-PU07	Inrush overheat
Name	Inrush current limit circuit fault			
Description	Stops the inverter output when the resistor of inrush current limit circuit overheated. The inrush current limit circuit failure			
Check point	· Check that frequent power ON/OFF is not repeated. · Check that the primary side fuse (5A) in the power supply circuit of the inrush current limit circuit contactor (FR-A740-110K or higher) is not fused. · Check that the power supply circuit of inrush current limit circuit contactor is not damaged.			
Corrective action	Configure a circuit where frequent power ON/OFF is not repeated. If the problem still persists after taking the above measure, please contact your sales representative.			

Operation Panel Indication	E.SER	ESEr	FR-PU04	Fault 14
			FR-PU07	VFD Comm error
Name	Communication fault (inverter)			
Description	This function stops the inverter output when communication error occurs consecutively for more than permissible retry count when a value other than "9999" is set in *Pr. 335 RS-485 communication retry count* during RS-485 communication from the RS-485 terminals. This function also stops the inverter output if communication is broken for the period of time set in *Pr. 336 RS-485 communication check time interval*.			
Check point	Check the RS-485 terminal wiring.			
Corrective action	Perform wiring of the RS-485 terminals properly.			

Operation Panel Indication	E.AIE	EAI E	FR-PU04	Fault 14
			FR-PU07	Analog in error
Name	Analog input fault			
Description	Stops the inverter output when a 30mA or higher current or a 7.5V or higher voltage is input to terminal 2 while the current input is selected by *Pr. 73 Analog input selection*, or to terminal 4 while the current input is selected by *Pr. 267 Terminal 4 input selection*.			
Check point	Check the setting of *Pr. 73 Analog input selection*, *Pr. 267 Terminal 4 input selection* and voltage/current input switch. *(Refer to Chapter 4 of the Instruction Manual (Applied).)*			
Corrective action	Either give a frequency command by current input or set *Pr. 73 Analog input selection*, *Pr. 267 Terminal 4 input selection*, and voltage/current input switch to voltage input.			

Operation Panel Indication	E.USB	EUSb	FR-PU04	Fault 14
			FR-PU07	USB comm error
Name	USB communication fault			
Description	When the time set in *Pr. 548 USB communication check time interval* has broken, this function stops the inverter output.			
Check point	Check the USB communication cable.			
Corrective action	· Check the *Pr. 548 USB communication check time interval* setting. · Check the USB communication cable. · Increase the *Pr. 548 USB communication check time interval* setting. Or, change the setting to 9999. *(Refer to Chapter 4 of the Instruction Manual (Applied))*			

Operation Panel Indication	E.11	E. 11	FR-PU04 FR-PU07	Fault 11
Name	Opposite rotation deceleration fault			
Description	The speed may not decelerate during low speed operation if the rotation direction of the speed command and the estimated speed differ when the rotation is changing from forward to reverse or from reverse to forward during torque control under Real sensorless vector control. At this time, the inverter output is stopped if the rotation direction will not change, causing overload. This fault is not available in the initial status (V/F control). (It is available only during Real sensorless vector control.)			
Check point	Check that the rotation direction is not switched from forward to reverse rotation (or from reverse to forward) during torque control under Real sensorless vector control.			
Corrective action	· Prevent the motor from switching the rotation direction from forward to reverse (or from reverse to forward) during torque control under Real sensorless vector control. · Please contact your sales representative.			

Operation Panel Indication	E.13	E. 13	FR-PU04 FR-PU07	Fault 13
Name	Internal circuit fault			
Description	Stop the inverter output when an internal circuit fault occurred.			
Corrective action	Please contact your sales representative.			

CAUTION

- If protective functions of E.ILF, E.PTC, E.PE2, E.EP, E.OD, E.CDO, E.IOH, E.SER, E.AIE, E.USB are activated when using the FR-PU04, "Fault 14" appears.
  Also when the faults history is checked on the FR-PU04, the display is "E.14".
- If faults other than the above appear, contact your sales representative.

4.4 Correspondences between digital and actual characters

There are the following correspondences between the actual alphanumeric characters and the digital characters displayed on the operation panel.

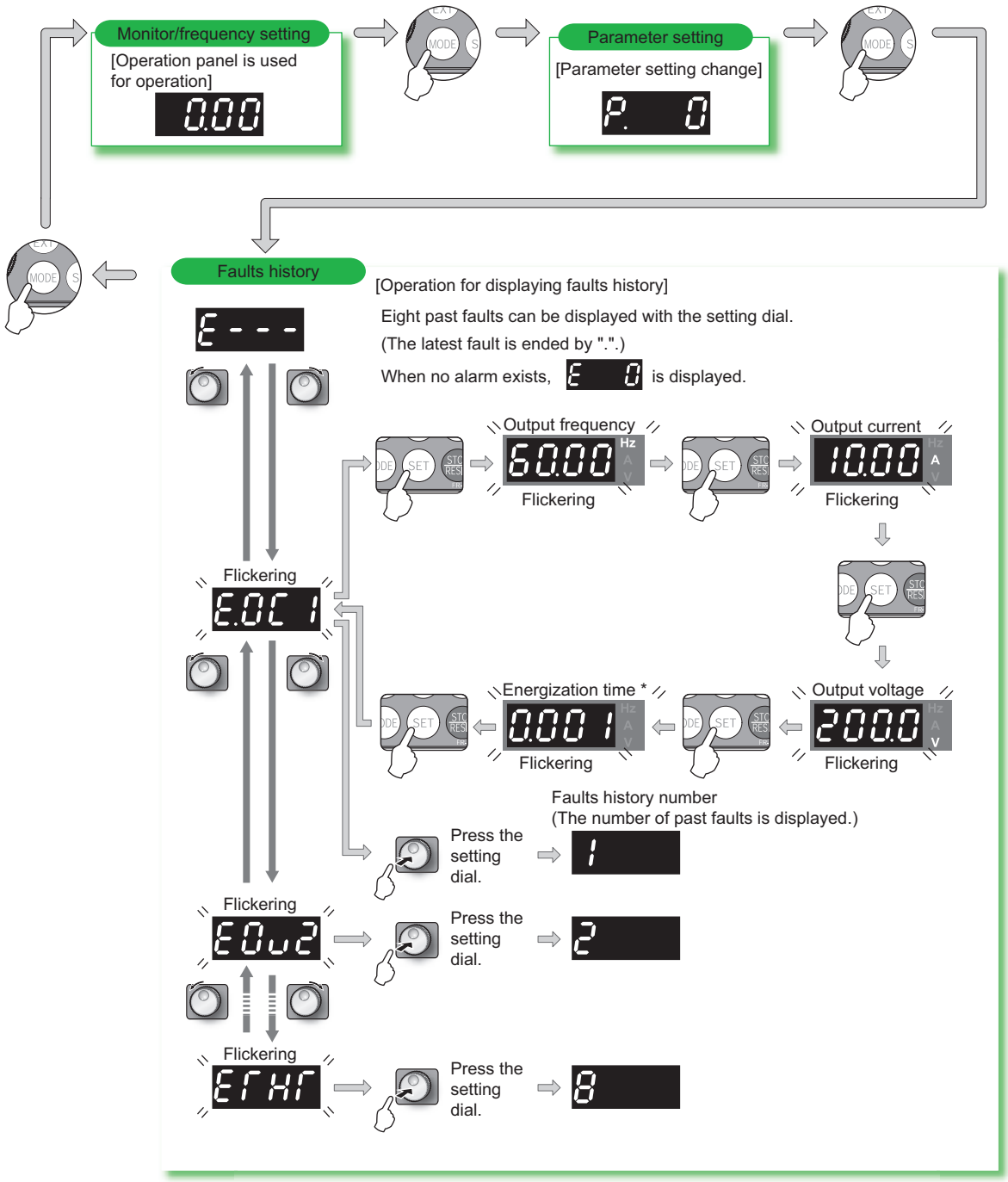
Actual	Digital
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

Actual	Digital
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
L	

Actual	Digital
M	
N	
O	
o	
P	
S	
T	
U	
V	
r	
-	

4.5 Check and clear of the faults history

(1) Check for the faults history



* The cumulative energization time and actual operation time are accumulated from 0 to 65535 hours, then cleared, and accumulated again from 0. When the operation panel (FR-DU07) is used, the time is displayed up to 65.53 (65530h) in the indication of 1h = 0.001, and thereafter, it is added up from 0.

(2) Clearing procedure

POINT

· The faults history can be cleared by setting "1" in *Er.CL Faults history clear*.

Operation

1. Screen at power-ON

The monitor display appears.

2. Parameter setting mode

Press (MODE) to choose the parameter setting mode.

(The parameter number previously read appears.)

3. Selecting the parameter number

Turn  until "Er.CL" (faults history clear) appears.

Press (SET) to read the present set value. "0" (initial value) appears.

4. Faults history clear

Turn  to change it to the set value "1". Press (SET) to set.

"1" and "Er.CL" flicker alternately after the faults history is cleared.

·By turning  , you can read another parameter.

·Press (SET) to show the setting again.

·Press (SET) twice to show the next parameter.

4.6 Check first when you have a trouble

Refer to troubleshooting on *page 80* (speed control) in addition to the following check points.

POINT

- If the cause is still unknown after every check, it is recommended to initialize the parameters (initial value) then reset the required parameter values and check again.
- Refer to the *Instruction Manual (Applied)* for 🕮 in "Refer to page" column.

4.6.1 Motor does not start

Check points	Possible Cause	Countermeasures	Refer to page
Main Circuit	Appropriate power supply voltage is not applied. (Operation panel display is not provided.)	Power ON a moulded case circuit breaker (MCCB), an earth leakage circuit breaker (ELB), or a magnetic contactor (MC).	—
		Check for the decreased input voltage, input phase loss, and wiring.	
		If only the control power is ON when using a separate power source for the control circuit, turn ON the main circuit power.	*17*
	Motor is not connected properly.	Check the wiring between the inverter and the motor. If commercial power supply-inverter switchover function is active, check the wiring of the magnetic contactor connected between the inverter and the motor.	*11*
	The jumper across P/+ and P1 is disconnected. (55K or lower)	Securely fit a jumper across P/+ and P1. When using a DC reactor (FR-HEL), remove the jumper across P/+ and P1, and then connect the DC reactor.	*11*
Input signal	Start signal is not input.	Check the start command source, and input a start signal. PU operation mode: FWD / REV External operation mode : STF/STR signal	*2*
	Both the forward and reverse rotation start signals (STF, STR) are input simultaneously.	Turn ON only one of the forward and reverse rotation start signals (STF or STR). If STF and STR signals are turned ON simultaneously in the initial setting, a stop command is given.	*19*
	Frequency command is zero. (FWD or REV LED on the operation panel is flickering.)	Check the frequency command source and enter a frequency command.	*2*
	AU signal is not ON when terminal 4 is used for frequency setting. (FWD or REV LED on the operation panel is flickering.)	Turn ON the AU signal. Turning ON the AU signal activates terminal 4 input.	*19*
	Output stop signal (MRS) or reset signal (RES) is ON. (FWD or REV LED on the operation panel is flickering.)	Turn MRS or RES signal OFF. Inverter starts the operation with a given start command and a frequency command after turning OFF MRS or RES signal. Before turning OFF, ensure the safety.	*19*
	CS signal is OFF when automatic restart after instantaneous power failure function is selected (*Pr. 57* ≠ "9999"). (FWD or REV LED on the operation panel is flickering.)	Turn ON the CS signal. Restart operation is enabled when restart after instantaneous power signal (CS) is ON.	🕮
	Jumper connector of sink - source is wrongly selected. (FWD or REV LED on the operation panel is flickering.)	Check that the control logic switchover jumper connector is correctly installed. If it is not installed correctly, input signal is not recognized.	*22*
	Wiring of encoder is incorrect. (Under encoder feedback control or vector control)	Check the wiring of encoder.	*31*
	Voltage/current input switch is not correctly set for analog input signal (0 to 5V/0 to 10V, 4 to 20mA). (FWD or REV LED on the operation panel is flickering.)	Set *Pr. 73, Pr. 267*, and a voltage/current input switch correctly, then input an analog signal in accordance with the setting.	*19*

Check points	Possible Cause	Countermeasures	Refer to page
Parameter Setting	STOP RESET was pressed. (Operation panel indication is PS (PS).)	During the External operation mode, check the method of restarting from a STOP RESET input stop from PU.	*141*
	Two-wire or three-wire type connection is wrong.	Check the connection. Connect STOP signal when three-wire type is used.	*119*
	Pr. 0 Torque boost setting is improper when V/F control is used.	Increase *Pr. 0* setting by 0.5% increments while observing the rotation of a motor. If that makes no difference, decrease the setting.	*59*
	Pr. 78 Reverse rotation prevention selection is set.	Check the *Pr. 78* setting. Set *Pr. 78* when you want to limit the motor rotation to only one direction.	*108*
	Pr. 79 Operation mode selection setting is wrong.	Select the operation mode which corresponds with input methods of start command and frequency command.	*2*
	Bias and gain *(calibration parameter C2 to C7)* settings are improper.	Check the bias and gain *(calibration parameter C2 to C7)* settings.	*113*
	Pr. 13 Starting frequency setting is greater than the running frequency.	Set running frequency higher than *Pr. 13*. The inverter does not start if the frequency setting signal is less than the value set in *Pr. 13*.	*96*
	Frequency settings of various running frequency (such as multi-speed operation) are zero. Especially, *Pr. 1 Maximum frequency* is zero.	Set the frequency command according to the application. Set *Pr. 1* higher than the actual frequency used.	*59*
	Pr. 15 Jog frequency setting is lower than *Pr. 13 Starting frequency*.	Set *Pr. 15 Jog frequency* higher than *Pr. 13 Starting frequency.*	*98*
	The *Pr.359 Encoder rotation direction* setting is incorrect under encoder feedback control or under vector control.	If the "REV" on the operation panel is lit even though the forward-rotation command is given, set *Pr. 359* ="1."	*33*
	Operation mode and a writing device do not match.	Check *Pr. 79, Pr. 338, Pr. 339, Pr. 550, Pr. 551,* and select an operation mode suitable for the purpose.	*62*, *124*
	Start signal operation selection is set by the *Pr. 250 Stop selection*	Check *Pr. 250* setting and connection of STF and STR signals.	*119*
	Inverter decelerated to a stop when power failure deceleration stop function is selected.	When power is restored, ensure the safety, and turn OFF the start signal once, then turn ON again to restart. Inverter restarts when *Pr. 261*="2, 12".	*120*
	Auto tuning is being performed.	In the PU operation, press STOP RESET on the operation panel after the offline auto tuning completes. In the External operation, turn OFF the start signal (STF, STR). By this operation, offline auto tuning is cancelled, and the monitor display on the PU goes back to normal. (If this operation is not performed, you cannot proceed to the next operation.)	*71*
	Automatic restart after instantaneous power failure function or power failure stop function is activated. (Performing overload operation during input phase loss may cause voltage insufficiency, and that may result in detection of power failure.)	• Set *Pr. 872 Input phase loss protection selection* = "1" (input phase failure protection active). • Disable the automatic restart after instantaneous power failure function and power failure stop function. • Reduce the load. • Increase the acceleration time if the automatic restart after instantaneous power failure function or power failure stop function occurred during acceleration.	*104*, *120*
Load	Load is too heavy.	Reduce the load.	—
	Shaft is locked.	Inspect the machine (motor).	—

4.6.2 Motor or machine is making abnormal acoustic noise

Even if the carrier frequency (*Pr. 72*) is set to a value higher than 2kHz for a 55k or lower capacity inverter, the carrier frequency is automatically lowered to as low as 2kHz in an overloaded operation at a low speed (output frequency lower than 3Hz). Acoustic noise from the motor increases, but it is not a fault. (*Refer to page 107* for *Pr. 72*.)

Check points	Possible Cause	Countermeasures	Refer to page
Input signal	Disturbance due to EMI when frequency command is given from analog input (terminal 1, 2, 4).	Take countermeasures against EMI.	📖
Parameter Setting		Increase the *Pr. 74 Input filter time constant* if steady operation cannot be performed due to EMI.	*107*
Parameter Setting	No carrier frequency noises (metallic noises) are generated.	In the initial setting, *Pr. 240 Soft-PWM operation selection* is enabled to change motor noise to an unoffending complex tone. Therefore, no carrier frequency noises (metallic noises) are generated. Set *Pr. 240* = "0" to disable this function.	*107*
	Resonance occurs. (output frequency)	Set *Pr. 31 to Pr. 36 (Frequency jump)*. When it is desired to avoid resonance attributable to the natural frequency of a mechanical system, these parameters allow resonant frequencies to be jumped.	*102*
	Resonance occurs. (carrier frequency)	Change *Pr. 72 PWM frequency selection* setting. Changing the PWM carrier frequency produces an effect on avoiding the resonance frequency of a mechanical system or a motor.	*107*
		Set a notch filter.	📖
	Auto tuning is not performed under Advanced magnetic flux vector control, Real sensorless vector control, or vector control.	Perform offline auto tuning.	*71*
	Gain adjustment during PID control is insufficient.	To stabilize the measured value, change the proportional band (*Pr. 129*) to a larger value, the integral time (*Pr. 130*) to a slightly longer time, and the differential time (*Pr. 134*) to a slightly shorter time. Check the calibration of set point and measured value.	*114*
	The gain is too high under Real sensorless vector control or vector control.	During speed control, check the setting of *Pr. 820* (*Pr. 830*) *speed control P gain*.	*130*
		During torque control, check the setting of *Pr. 824* (*Pr. 834*) *torque control P gain*.	*131*
Others	Mechanical looseness	Adjust machine/equipment so that there is no mechanical looseness.	—
	Contact the motor manufacturer.		
Motor	Operating with output phase loss	Check the motor wiring.	—

4.6.3 Inverter generates abnormal noise

Check points	Possible Cause	Countermeasures	Refer to page
Fan	Fan cover was not correctly installed when a cooling fan was replaced.	Install the fan cover correctly.	*167*

4.6.4 Motor generates heat abnormally

Check points	Possible Cause	Countermeasures	Refer to page
Motor	Motor fan is not working (Dust is accumulated.)	Clean the motor fan. Improve the environment.	—
	Phase to phase insulation of the motor is insufficient.	Check the insulation of the motor.	—
Main Circuit	The inverter output voltage (U, V, W) are unbalanced.	Check the output voltage of the inverter. Check the insulation of the motor.	*164*
Parameter Setting	The *Pr. 71 Applied motor* setting is wrong.	Check the *Pr. 71 Applied motor* setting.	*106*
—	Motor current is large.	Refer to "4.6.11 Motor current is too large"	*161*

4.6.5 Motor rotates in the opposite direction

Check points	Possible Cause	Countermeasures	Refer to page
Main Circuit	Phase sequence of output terminals U, V and W is incorrect.	Connect phase sequence of the output cables (terminal U, V, W) to the motor correctly.	*11*
Input signal	The start signals (forward rotation, reverse rotation) are connected improperly.	Check the wiring. (STF: forward rotation , STR: reverse rotation)	*19*
	The polarity of the frequency command is negative during the polarity reversible operation set by *Pr. 73 Analog input selection*.	Check the polarity of the frequency command.	🕮
Input signal Parameter setting	Torque command is negative during torque control under vector control.	Check the torque command value.	🕮

4.6.6 Speed greatly differs from the setting

Check points	Possible Cause	Countermeasures	Refer to page
Input signal	Frequency setting signal is incorrectly input.	Measure the input signal level.	—
	The input signal lines are affected by external EMI.	Take countermeasures against EMI such as using shielded wires for input signal lines.	🕮
Parameter Setting	*Pr. 1, Pr. 2, Pr. 18, calibration parameter C2 to C7* settings are improper.	Check the settings of *Pr. 1 Maximum frequency, Pr. 2 Minimum frequency, Pr. 18 High speed maximum frequency.*	*96*
		Check the *calibration parameter C2 to C7* settings.	*113*
	Pr. 31 to Pr. 36 (frequency jump) settings are improper.	Narrow down the range of frequency jump.	*102*
Load	Stall prevention (torque limit) function is activated due to a heavy load.	Reduce the load weight.	—
Parameter Setting		Set *Pr. 22 Stall prevention operation level (Torque limit level)* higher according to the load. (Setting *Pr. 22* too large may result in frequent overcurrent trip (E.OC☐).)	*99* (*100*)
Motor		Check the capacities of the inverter and the motor.	—

4.6.7 Acceleration/deceleration is not smooth

Check points	Possible Cause	Countermeasures	Refer to page
Parameter Setting	Acceleration/deceleration time is too short.	Increase acceleration/deceleration time.	*60*
	Torque boost (*Pr. 0, Pr. 46*, *Pr. 112*) setting is improper under V/F control, so the stall prevention function is activated.	Increase/decrease *Pr. 0 Torque boost* setting value by 0.5% increments to the setting. Deactivate stall prevention.	*59*
	The base frequency setting and the motor characteristic does not match.	For V/F control, set *Pr. 3 Base frequency*, *Pr. 47 Second V/F (base frequency)*, and *Pr.113 Third V/F (base frequency)*.	*96*
		For vector control, set *Pr.84 Rated motor frequency*.	*71*
	Regeneration avoidance operation is performed	If the frequency becomes unstable during regeneration avoidance operation, decrease the setting of *Pr. 886 Regeneration avoidance voltage gain*.	*134*
Load	Stall prevention (torque limit) function is activated due to a heavy load.	Reduce the load weight.	—
Parameter Setting		Set *Pr. 22 Stall prevention operation level (Torque limit level)* higher according to the load. (Setting *Pr. 22* too large may result in frequent overcurrent trip (E.OC☐).)	*99* (*100*)
Motor		Check the capacities of the inverter and the motor.	—

4.6.8 Speed varies during operation

When Advanced magnetic flux vector control, Real sensorless vector control, vector control or encoder feedback control is exercised, the output frequency varies with load fluctuation between 0 and 2Hz. This is a normal operation and is not a fault.

Check points	Possible Cause	Countermeasures	Refer to page
Load	Load varies during an operation.	Select Advanced magnetic flux vector control, Real sensorless vector control, vector control, or encoder feedback control.	*63*, *66*, 🕮
Input signal	Frequency setting signal is varying.	Check the frequency setting signal.	—
	The frequency setting signal is affected by EMI.	Set filter to the analog input terminal using *Pr. 74 Input filter time constant, Pr. 822 Speed setting filter 1*.	*107*
		Take countermeasures against EMI, such as using shielded wires for input signal lines.	🕮
	Malfunction is occurring due to the undesirable current generated when the transistor output unit is connected.	Use terminal PC (terminal SD when source logic) as a common terminal to prevent a malfunction caused by undesirable current.	*23*
	Multi-speed command signal is chattering.	Take countermeasures to suppress chattering.	—
	Feedback signal from the encoder is affected by EMI.	Place the encoder cable far from the EMI source such as main circuit and power supply voltage. Earth (ground) the shield of the encoder cable to the enclosure using a metal P-clip or U-clip.	*31*
Parameter Setting	Fluctuation of power supply voltage is too large.	Change the *Pr. 19 Base frequency voltage* setting (about 3%) under V/F control.	*96*
	Pr.80 Motor capacity and *Pr.81 Number of motor poles* are not appropriate for the motor capacity under Advanced magnetic flux vector control, Real sensorless vector control, or vector control.	Check the settings of *Pr.80 Motor capacity* and *Pr.81 Number of motor poles*.	*63*, *66*
	Wiring length exceeds 30m when Advanced magnetic flux vector control, Real sensorless vector control, or vector control is selected.	Perform offline auto tuning.	*71*
	Wiring length is too long for V/F control, and the a voltage drop occurs.	Adjust the *Pr. 0 Torque boost* setting by increasing with 0.5% increments for the low-speed operation.	*59*
		Change the control method to Advanced magnetic flux vector control or Real sensorless vector control.	*63*
	Hunting occurs by the generated vibration, for example, when structural rigidity at load side is insufficient.	Disable automatic control functions, such as the energy saving operation, the fast-response current limit function, the torque limit, the regeneration avoidance function, Advanced magnetic flux vector control, Real sensorless vector control, vector control, encoder feedback control, droop control, the stall prevention, online auto tuning, the notch filter, and orientation control. During the PID control, set smaller values to *Pr.129 PID proportional band* and *Pr.130 PID integral time*. Lower the control gain, and adjust to increase the stability.	—
		Change *Pr. 72 PWM frequency selection* setting.	*107*

4.6.9 Operation mode is not changed properly

Check points	Possible Cause	Countermeasures	Refer to page
Input signal	Start signal (STF or STR) is ON.	Check that the STF and STR signals are OFF. When either is ON, the operation mode cannot be changed.	62
Parameter Setting	*Pr. 79* setting is improper.	When *Pr. 79 Operation mode selection* setting is "0" (initial value), the inverter is placed in the External operation mode at input power ON. To switch to the PU operation mode, press PU/EXT on the operation panel (press PU when the parameter unit (FR-PU04/FR-PU07) is used) . At other settings (1 to 4, 6, 7), the operation mode is limited accordingly.	62
	Operation mode and a writing device do not correspond.	Check *Pr. 79, Pr. 338, Pr. 339, Pr. 550, Pr. 551,* and select an operation mode suitable for the purpose.	62, 124

4.6.10 Operation panel (FR-DU07) display is not operating

Check points	Possible Cause	Countermeasures	Refer to page
Main Circuit, Control Circuit	Power is not input.	Input the power.	9
Front cover	Operation panel is not properly connected to the inverter.	Check if the inverter front cover is installed securely. The inverter cover may not fit properly when using wires whose size are 1.25mm^2 or larger, or when using many wires, and this could cause a contact fault of the operation panel.	6

4.6.11 Motor current is too large

Check points	Possible Cause	Countermeasures	Refer to page
Parameter Setting	Torque boost (*Pr. 0, Pr. 46, Pr. 112*) setting is improper under V/F control, so the stall prevention function is activated.	Increase/decrease *Pr. 0 Torque boost* setting value by 0.5% increments to the setting.	59
	V/F pattern is improper when V/F control is performed. (*Pr. 3, Pr. 14, Pr. 19*)	Set rated frequency of the motor to *Pr. 3 Base frequency*. Use *Pr. 19 Base frequency voltage* to set the base voltage (e.g. rated motor voltage).	96
		Change *Pr. 14 Load pattern selection* according to the load characteristic.	98
	Stall prevention (torque limit) function is activated due to a heavy load.	Reduce the load weight.	—
		Set *Pr. 22 Stall prevention operation level (Torque limit level)* higher according to the load. (Setting *Pr. 22* too large may result in frequent overcurrent trip (E.OC☐).)	99 (100)
		Check the capacities of the inverter and the motor.	—
	Auto tuning is not performed under Advanced magnetic flux vector control, Real sensorless vector control, or vector control.	Perform offline auto tuning.	71

4.6.12 Speed does not accelerate

Check points	Possible Cause	Countermeasures	Refer to page
Input signal	Start command and frequency command are chattering.	Check if the start command and the frequency command are correct.	—
	The wiring length used for analog frequency command is too long, and it is causing a voltage (current) drop.	Perform analog input bias/gain calibration.	📖
	Input signal lines are affected by external EMI.	Take countermeasures against EMI, such as using shielded wires for input signal lines.	📖
Parameter Setting	*Pr. 1, Pr. 2, Pr. 18, calibration parameter C2 to C7* settings are improper.	Check the settings of *Pr. 1 Maximum frequency and Pr. 2 Minimum frequency*. If you want to run the motor at 120Hz or higher, set *Pr. 18 High speed maximum frequency*.	*96*
		Check the *calibration parameter C2 to C7* settings.	*113*
	The maximum voltage (current) input value is not set during the external operation. *(Pr.125, Pr.126, Pr.18)*	Check the *Pr.125 Terminal 2 frequency setting gain frequency* and *Pr.126 Terminal 4 frequency setting gain frequency* settings. To operate at 120Hz or higher, set *Pr.18 High speed maximum frequency*.	*90*
	Torque boost (*Pr. 0, Pr. 46, Pr. 112*) setting is improper under V/F control, so the stall prevention function is activated.	Increase/decrease *Pr. 0 Torque boost* setting value by 0.5% increments so that stall prevention does not occur.	*59*
	V/F pattern is improper when V/F control is performed. (*Pr. 3, Pr. 14, Pr. 19*)	Set rated frequency of the motor to *Pr. 3 Base frequency*. Use *Pr. 19* Base frequency voltage to set the base voltage (e.g. rated motor voltage).	*96*
		Change *Pr. 14 Load pattern selection* according to the load characteristic.	*98*
	Stall prevention (torque limit) function is activated due to a heavy load.	Reduce the load weight.	—
		Set *Pr. 22 Stall prevention operation level (Torque limit level)* higher according to the load. (Setting *Pr. 22* too large may result in frequent overcurrent trip (E.OC☐).)	*99* (*100*)
		Check the capacities of the inverter and the motor.	—
	Auto tuning is not performed under Advanced magnetic flux vector control, Real sensorless vector control, or vector control.	Perform offline auto tuning.	*71*
	The setting of pulse train input is improper.	Check the specification of the pulse generator (open collector output or complementary output) and check the adjustment of the pulse train and frequency (*Pr. 385* and *Pr. 386*).	📖
	During PID control, output frequency is automatically controlled to make measured value = set point.		📖
Main Circuit	Brake resistor is connected across terminals P/+ and P1 or across P1 and PR by mistake. (22K or lower)	Remove the jumper across terminals PR and PX (7.5K or lower) and connect an option brake resistor (FR-ABR) across terminals P/+ and PR.	*9*

4.6.13 Unable to write parameter setting

Check points	Possible Cause	Countermeasures	Refer to page
Input signal	Operation is being performed (signal STF or STR is ON).	Stop the operation. When *Pr. 77* = "0" (initial value), write is enabled only during a stop.	*108*
Parameter Setting	You are attempting to set the parameter in the External operation mode.	Choose the PU operation mode. Or, set *Pr. 77* = "2" to enable parameter write regardless of the operation mode.	*108*
	Parameter is disabled by the *Pr. 77 Parameter write selection* setting.	Check *Pr. 77 Parameter write selection* setting.	*108*
	Key lock is activated by the *Pr. 161 Frequency setting/key lock operation selection* setting.	Check *Pr. 161 Frequency setting/key lock operation selection* setting.	*116*
	Operation mode and a writing device do not correspond.	Check *Pr. 79, Pr. 338, Pr. 339, Pr. 550, Pr. 551,* and select an operation mode suitable for the purpose.	*62*, *124*

4.6.14 Power lamp is not lit

Check points	Possible Cause	Countermeasures	Refer to page
Main Circuit, Control Circuit	Wiring or installation is improper.	Check for the wiring and the installation. Power lamp is lit when power is input to the control circuit (R1/L11, S1/L21).	*11*

5 PRECAUTIONS FOR MAINTENANCE AND INSPECTION

The inverter is a static unit mainly consisting of semiconductor devices. Daily inspection must be performed to prevent any fault from occurring due to the adverse effects of the operating environment, such as temperature, humidity, dust, dirt and vibration, changes in the parts with time, service life, and other factors.

• Precautions for maintenance and inspection

For some short time after the power is switched OFF, a high voltage remains in the smoothing capacitor. When accessing the inverter for inspection, wait for at least 10 minutes after the power supply has been switched OFF, and then make sure that the voltage across the main circuit terminals P/+ and N/− of the inverter is not more than 30VDC using a tester, etc.

5.1 Inspection item

5.1.1 Daily inspection

Basically, check for the following faults during operation.
(1) Motor operation fault
(2) Improper installation environment
(3) Cooling system fault
(4) Unusual vibration and noise
(5) Unusual overheat and discoloration

5.1.2 Periodic inspection

Check the areas inaccessible during operation and requiring periodic inspection.
Consult us for periodic inspection.
1) Check for cooling system fault ..... Clean the air filter, etc.
2) Tightening check and retightening ..... The screws and bolts may become loose due to vibration, temperature changes, etc.
Tighten them according to the specified tightening torque. *(Refer to page 14)*
3) Check the conductors and insulating materials for corrosion and damage.
4) Measure insulation resistance.
5) Check and change the cooling fan and relay.

5.1.3 Daily and periodic inspection

Area of Inspection	Inspection Item	Description	Interval		Corrective Action at Alarm Occurrence	Customer's Check
			Daily	Periodic *2		
General	Surrounding environment	Check the surrounding air temperature, humidity, dirt, corrosive gas, oil mist , etc.	○		Improve environment	
	Overall unit	Check for unusual vibration and noise.	○		Check alarm location and retighten	
	Power supply voltage	Check that the main circuit voltages and control voltages are normal.*1	○		Inspect the power supply	
Main circuit	General	(1) Check with megger (across main circuit terminals and earth (ground) terminal).		○	Contact the manufacturer	
		(2) Check for loose screws and bolts.		○	Retighten	
		(3) Check for overheat traces on the parts.		○	Contact the manufacturer	
		(4) Check for stain.		○	Clean	
	Conductors, cables	(1) Check conductors for distortion.		○	Contact the manufacturer	
		(2) Check cable sheaths for breakage and deterioration (crack, discoloration, etc.).		○	Contact the manufacturer	
	Transformer/reactor	Check for unusual odor and abnormal increase in whining sound.	○		Stop the device and contact the manufacturer.	
	Terminal block	Check for damage.		○	Stop the device and contact the manufacturer.	
	Smoothing aluminum electrolytic capacitor	(1) Check for liquid leakage.		○	Contact the manufacturer	
		(2) Check for safety valve projection and bulge.		○	Contact the manufacturer	
		(3) Visual check and judge by the life check of the main circuit capacitor. *(Refer to page 165)*		○		
	Relay/contactor	Check that the operation is normal and no chatter is heard.		○	Contact the manufacturer	
	Resistor	(1) Check for crack in resistor insulation.		○	Contact the manufacturer	
		(2) Check for a break in the cable.		○	Contact the manufacturer	
Control circuit protective circuit	Operation check	(1) Check that the output voltages across phases with the inverter operated alone is balanced.		○	Contact the manufacturer	
		(2) Check that no fault is found in protective and display circuits in a sequence protective operation test.		○	Contact the manufacturer	
	Parts check: Overall	(1) Check for unusual odor and discoloration.		○	Stop the device and contact the manufacturer.	
		(2) Check for serious rust development.		○	Contact the manufacturer	
	Parts check: Aluminum electrolytic capacitor	(1) Check for liquid leakage in a capacitor and deformation trace.		○	Contact the manufacturer	
		(2) Visual check and judge by the life check of the control circuit capacitor. *(Refer to page 165.)*		○		
Cooling system	Cooling fan	(1) Check for unusual vibration and noise.	○		Replace the fan	
		(2) Check for loose screws and bolts.		○	Fix with the fan cover fixing screws	
		(3) Check for stain.		○	Clean	
	Heatsink	(1) Check for clogging.		○	Clean	
		(2) Check for stain.		○	Clean	
	Air filter, etc.	(1) Check for clogging.		○	Clean or replace	
		(2) Check for stain.		○	Clean or replace	
Display	Indication	(1) Check that display is normal.	○		Contact the manufacturer	
		(2) Check for stain.		○	Clean	
	Meter	Check that reading is normal.	○		Stop the device and contact the manufacturer.	
Load motor	Operation check	Check for vibration and abnormal increase in operation noise.	○		Stop the device and contact the manufacturer.	

*1 It is recommended to install a device to monitor voltage for checking the power supply voltage to the inverter.

*2 One to two years of periodic inspection cycle is recommended. However, it differs according to the installation environment. Consult us for periodic inspection.

5.1.4 Display of the life of the inverter parts

The self-diagnostic alarm is output when the life span of the control circuit capacitor, cooling fan, each parts of the inrush current limit circuit is near its end. It gives an indication of replacement time .

The life alarm output can be used as a guideline for life judgement.

Parts	Judgement Level
Main circuit capacitor	85% of the initial capacity
Control circuit capacitor	Estimated 10% life remaining
Inrush current limit circuit	Estimated 10% life remaining (Power on: 100,000 times left)
Cooling fan	Less than 50% of the predetermined speed

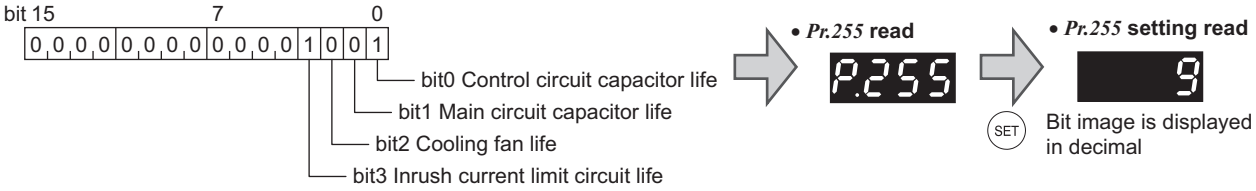
For the life check of the main circuit capacitor, the alarm signal (Y90) will not be output if a measuring method of (2) is not performed. *(Refer to page 166.)*

REMARKS

- Since repeated inrush currents at power ON will shorten the life of the converter circuit, frequent starts and stops of the magnetic contactor must be avoided.

(1) Display of the life alarm

- *Pr. 255 Life alarm status display* can be used to confirm that the control circuit capacitor, main circuit capacitor, cooling fan, and each parts of the inrush current limit circuit has reached the life alarm output level.



Pr. 255 (decimal)	Bit (binary)	Inrush Current Limit Circuit Life	Cooling Fan Life	Main Circuit Capacitor Life	Control Circuit Capacitor Life
15	1111	○	○	○	○
14	1110	○	○	○	×
13	1101	○	○	×	○
12	1100	○	○	×	×
11	1011	○	×	○	○
10	1010	○	×	○	×
9	1001	○	×	×	○
8	1000	○	×	×	×
7	0111	×	○	○	○
6	0110	×	○	○	×
5	0101	×	○	×	○
4	0100	×	○	×	×
3	0011	×	×	○	○
2	0010	×	×	○	×
1	0001	×	×	×	○
0	0000	×	×	×	×

○: with alarm, ×: without alarm

POINT

Life check of the main circuit capacitor needs to be done by *Pr. 259*. (Refer to the following.)

(2) Measuring method of life of the main circuit capacitor

- If the value of capacitor capacity measured before shipment is considered as 100%, *Pr. 255* bit1 is turned on when the measured value falls below 85%.
- Measure the capacitor capacity according to the following procedure and check the deterioration level of the capacitor capacity.
  1) Check that the motor is connected and at a stop.
  2) Set "1" (measuring start) in *Pr. 259*
  3) Switch power off. The inverter applies DC voltage to the motor to measure the capacitor capacity while the inverter is off.
  4) After confirming that the LED of the operation panel is off, power on again.
  5) Check that "3" (measuring completion) is set in *Pr. 259*, then read *Pr. 258* and check the life of the main circuit capacitor.

REMARKS

- When the main circuit capacitor life is measured under the following conditions, "forced end" (*Pr. 259* = "8") or "measuring error" (*Pr. 259* = "9") occurs or it remains in "measuring start" (*Pr. 259* = "1").
  When measuring, avoid the following conditions to perform. In addition, even when "measurement completion" (*Pr. 259* = "3") is confirmed under the following conditions, normal measurement can not be done.
  (a)FR-HC, MT-HC, FR-CV, MT-RC or sine wave filter is connected.
  (b)Terminal R1/L11, S1/L21 or DC power supply is connected to the terminals P/+ and N/−.
  (c)Switch power on during measuring.
  (d)The motor is not connected to the inverter.
  (e)The motor is running.(The motor is coasting.)
  (f)The motor capacity is two rank smaller as compared to the inverter capacity.
  (g)The inverter is tripped or a fault occurred while power is off.
  (h)The inverter output is shut off with the MRS signal.
  (i)The start command is given while measuring.
- Operating environment: Surrounding air temperature (annual average 40°C (free from corrosive gas, flammable gas, oil mist, dust and dirt))
  Output current (80% of the inverter rated current)

POINT

For accurate life measurement of the main circuit capacitor, wait 3 hours or longer after turning OFF. The temperature left in the main circuit capacitor affects measurement.

⚠ WARNING

⚠ When measuring the main circuit capacitor capacity (*Pr. 259 Main circuit capacitor life measuring* = "1"), the DC voltage is applied to the motor for 1s at powering off. Never touch the motor terminal, etc. right after powering off to prevent an electric shock.

5.1.5 Cleaning

Always run the inverter in a clean status.
When cleaning the inverter, gently wipe dirty areas with a soft cloth immersed in neutral detergent or ethanol.

CAUTION

Do not use solvent, such as acetone, benzene, toluene and alcohol, as they will cause the inverter surface paint to peel off.
The display, etc. of the operation panel (FR-DU07) and parameter unit (FR-PU04/FR-PU07) are vulnerable to detergent and alcohol. Therefore, avoid using them for cleaning.

5.1.6 Replacement of parts

The inverter consists of many electronic parts such as semiconductor devices.
The following parts may deteriorate with age because of their structures or physical characteristics, leading to reduced performance or fault of the inverter. For preventive maintenance, the parts must be replaced periodically.
Use the life check function as a guidance of parts replacement.

Part Name	Estimated lifespan *1	Description
Cooling fan	10 years	Replace (as required)
Main circuit smoothing capacitor	10 years *2	Replace (as required)
On-board smoothing capacitor	10 years	Replace the board (as required)
Relays	–	as required
Fuse (160K or higher)	10 years	Replace the fuse (as required)

*1 Estimated lifespan for when the yearly average surrounding air temperature is 40°C (without corrosive gas, flammable gas, oil mist, dust and dirt etc)
*2 Output current : 80% of the inverter rated current

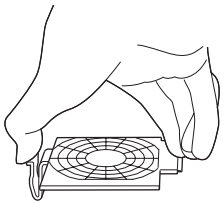
CAUTION

For parts replacement, consult the nearest Mitsubishi FA Center.

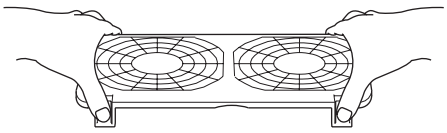
(1) Cooling fan

The replacement interval of the cooling fan used for cooling the parts generating heat such as the main circuit semiconductor is greatly affected by the surrounding air temperature. When unusual noise and/or vibration is noticed during inspection, the cooling fan must be replaced immediately.

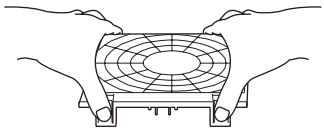
• Removal (FR-A720-1.5K to 90K, FR-A740-2.2K to 132K)
1) Push the hooks from above and remove the fan cover.



FR-A720-1.5K to 3.7K
FR-A740-2.2K, 3.7K

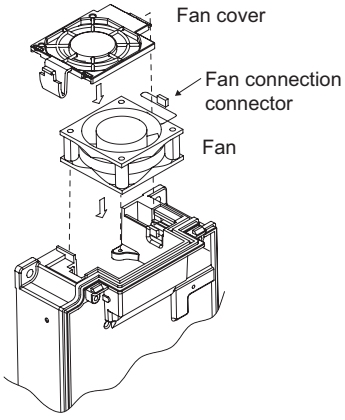


FR-A720-5.5K to 22K
FR-A740-5.5K to 22K

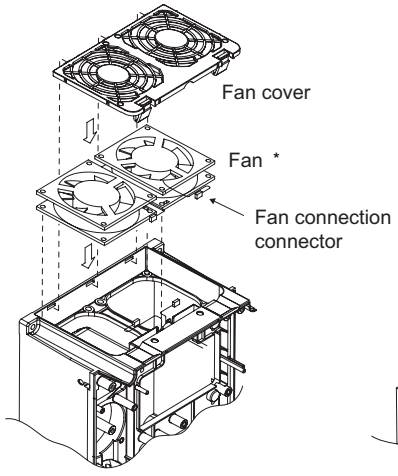


FR-A720-30K or higher
FR-A740-30K to 132K

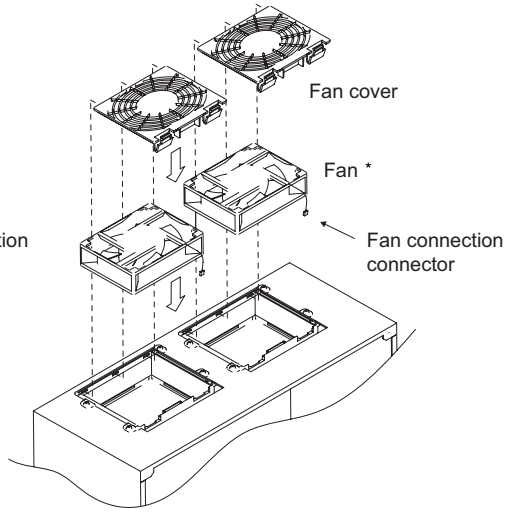
2) Disconnect the fan connectors.
3) Remove the fan.



FR-A720-1.5K to 3.7K
FR-A740-2.2K, 3.7K



FR-A720-5.5K to 22K
FR-A740-5.5K to 22K

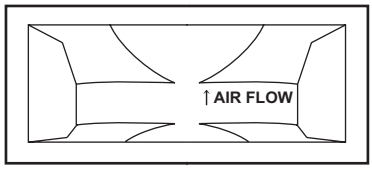


FR-A720-30K or higher
FR-A740-30K to 132K

* The number of cooling fans differs according to the inverter capacity.

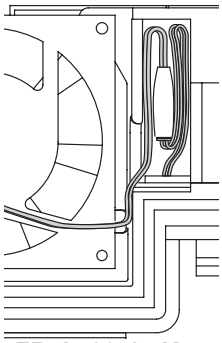
• Reinstallation (FR-A720-1.5K to 90K, FR-A740-2.2K to 132K)

1)After confirming the orientation of the fan, reinstall the fan so that the arrow on the left of "AIR FLOW" faces up.

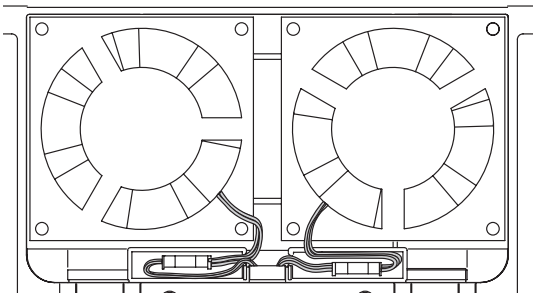


<Fan side face>

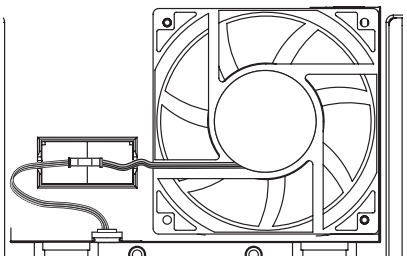
2)Reconnect the fan connectors.



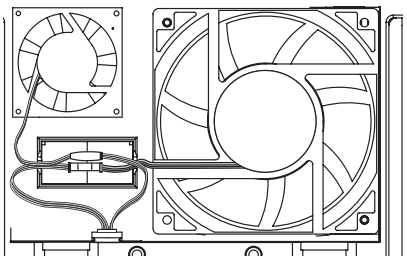
FR-A720-1.5K to 3.7K
FR-A740-2.2K, 3.7K



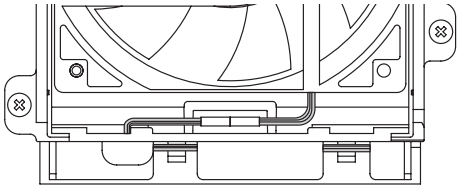
FR-A720-5.5K to 11K
FR-A740-5.5K to 15K



FR-A720-15K, 18.5K
FR-A740-18.5K, 22K

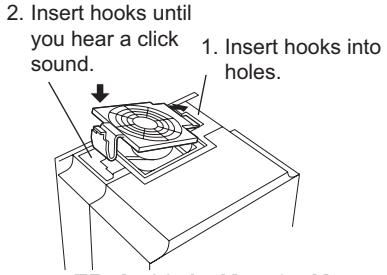


FR-A720-22K

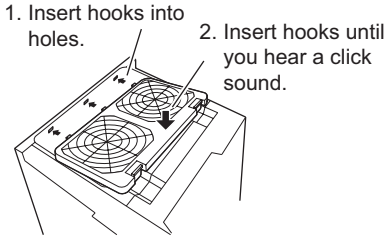


FR-A720-30K or higher
FR-A740-30K to 132K

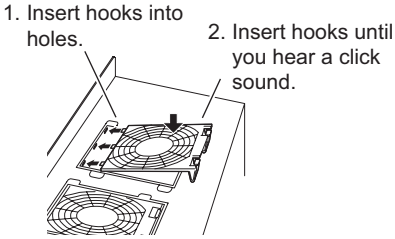
3) Reinstall the fan cover.



FR-A720-1.5K to 3.7K
FR-A740-2.2K, 3.7K



FR-A720-5.5K to 22K
FR-A740-5.5K to 22K

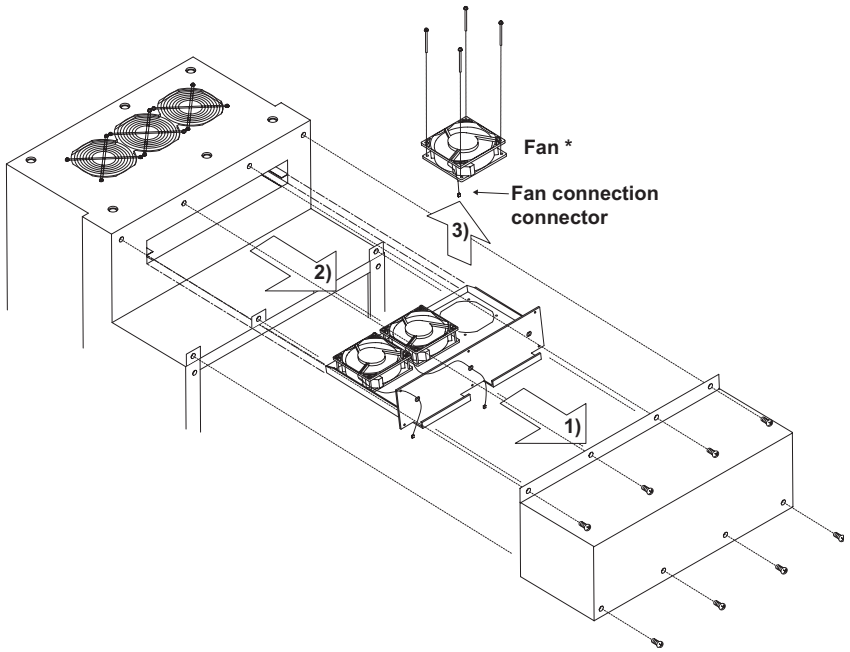


FR-A720-30K or higher
FR-A740-30K to 132K

CAUTION

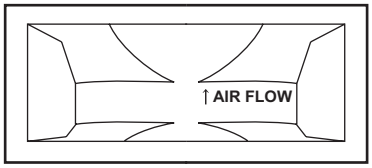
- Installing the fan in the opposite of air flow direction can cause the inverter life to be shorter.
- Prevent the cable from being caught when installing a fan.
- Switch the power off before replacing fans. Since the inverter circuits are charged with voltage even after power off, replace fans only when the inverter cover is on the inverter to prevent an electric shock accident.

• Removal (FR-A740-160K or higher)
1) Remove a fan cover.
2) After removing a fan connector, remove a fan block.
3) Remove the fan. (Make sure to remove the fan cable from the clamp of the fan block beforehand.)



* The number of cooling fans differs according to the inverter capacity.

• Reinstallation (FR-A740-160K or higher)
1) After confirming the orientation of the fan, reinstall the fan so that the arrow on the left of "AIR FLOW" faces up.



<Fan side face>

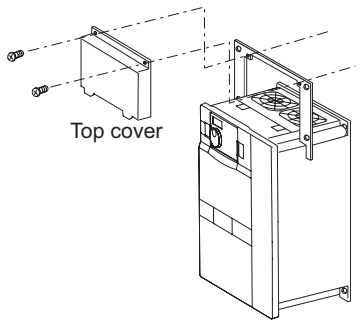
2) Install fans referring to the above figure.

CAUTION

- Installing the fan in the opposite air flow direction can cause the inverter life to be shorter.
- Prevent the cable from being caught when installing a fan.
- Switch the power OFF before replacing fans. Since the inverter circuits are charged with voltage even after power OFF, replace fans only when the inverter cover is on the inverter to prevent an electric shock accident.

(2) Replacement procedure of the cooling fan when using a heatsink protrusion attachment (FR-A7CN)

When replacing a cooling fan, remove a top cover of the heatsink protrusion attachment and perform replacement. After replacing the cooling fan, replace the top cover in the original position.



(3) Smoothing capacitors

A large-capacity aluminum electrolytic capacitor is used for smoothing in the main circuit DC section, and an aluminum electrolytic capacitor is used for stabilizing the control power in the control circuit. Their characteristics are deteriorated by the adverse effects of ripple currents, etc.
The replacement intervals greatly vary with the surrounding air temperature and operating conditions. When the inverter is operated in air-conditioned, normal environment conditions, replace the capacitors about every 10 years.
The appearance criteria for inspection are as follows:
1) Case: Check the side and bottom faces for expansion
2) Sealing plate: Check for remarkable warp and extreme crack.
3) Check for external crack, discoloration, fluid leakage, etc. Judge that the capacitor has reached its life when the measured capacitance of the capacitor reduced below 80% of the rating.

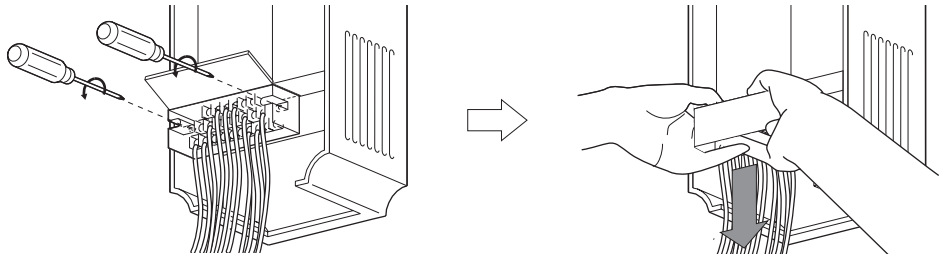
Refer to page 166 to perform the life check of the main circuit capacitor.

(4) Relays

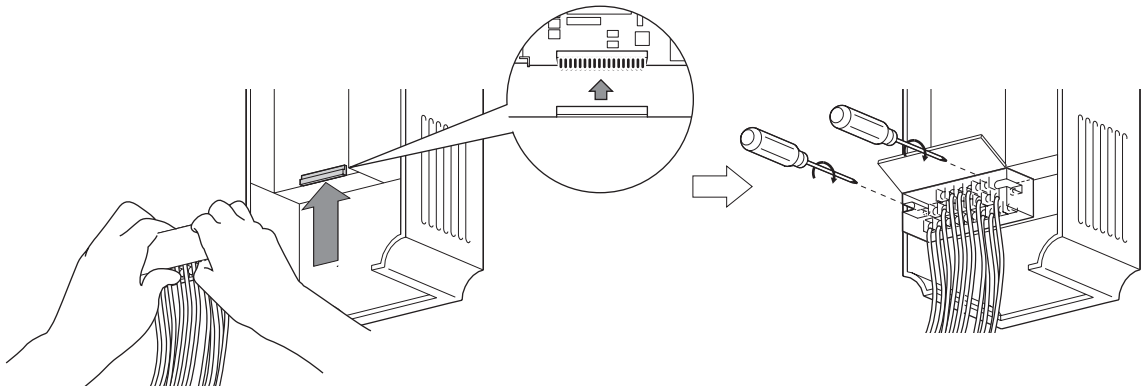
To prevent a contact fault, etc., relays must be replaced according to the cumulative number of switching times (switching life).

5.1.7 Inverter replacement

The inverter can be replaced with the control circuit wiring kept connected. Before replacement, remove the wiring cover of the inverter.
1) Loosen the two installation screws in both ends of the control circuit terminal block. (These screws cannot be removed.) Pull down the terminal block from behind the control circuit terminals.



2) Using care not to bend the pins of the inverter's control circuit connector, reinstall the control circuit terminal block and fix it with the mounting screws.



CAUTION

Before starting inverter replacement, switch power OFF, wait for at least 10 minutes, and then check the voltage with a tester and such to ensure safety.

6 SPECIFICATIONS

6.1 Inverter rating

●200V class

Model FR-A720-□□K			0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90
Applicable motor capacity (kW) *1			0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90
Output	Rated capacity (kVA) *2		1.1	1.9	3.1	4.2	6.7	9.2	12.6	17.6	23.3	29	34	44	55	67	82	110	132
	Rated current (A) *3		3	5	8	11	17.5	24	33	46	61	76	90	115	145	175	215	288 (245)	346 (294)
	Overload current rating *4		150% 60s, 200% 3s (inverse-time characteristics) surrounding air temperature 50°C																
	Rated voltage *5		Three-phase 200 to 240V																
	Regenerative braking torque	Maximum value/ permissible duty	150% torque/ 3%ED*6			100% torque/ 3%ED*6		100% torque/ 2%ED*6		20% torque/ continuous *6				20% torque/ continuous				10% torque/ continuous	
Power supply	Rated input AC voltage/frequency		Three-phase 200 to 220V 50Hz, 200 to 240V 60Hz																
	Permissible AC voltage fluctuation		170 to 242V 50Hz,170 to 264V 60Hz																
	Permissible frequency fluctuation		±5%																
	Power supply capacity (kVA) *7		1.5	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80	100	110	132
Protective structure (JEM 1030) *9			Enclosed type (IP20) *8											Open type (IP00)					
Cooling system			Self-cooling		Forced air cooling														
Approx. mass (kg)			1.9	2.3	3.8	3.8	3.8	7.1	7.1	7.5	13	13	14	23	35	35	58	70	70

*1. The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.

*2. The rated output capacity indicated assumes that the output voltage is 220V.

*3. When operating the inverter of 75K or higher with a value larger than 2kHz set in *Pr. 72 PWM frequency selection*, the rated output current is the value in parenthesis.

*4. The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.

*5. The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.

*6. With the dedicated external brake resistor FR-ABR (option), the 0.4K and 0.75K, 1.5K to 7.5K, 11K to 22K will achieve the performance of 150% torque/ 10%ED, 100% torque/10%ED and 100% torque/6%ED respectively.

*7. The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).

*8. When the hook of the inverter front cover is cut off for installation of the plug-in option, protective structure of the inverter changes to an open type (IP00).

*9. FR-DU07:IP40 (except for the PU connector)

●400V class

Model FR-A740-□□K			0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Applicable motor capacity (kW) *1			0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Output	Rated capacity (kVA) *2		1.1	1.9	3	4.6	6.9	9.1	13	17.5	23.6	29	32.8	43.4	54	65	84
	Rated current (A)		1.5	2.5	4	6	9	12	17	23	31	38	44	57	71	86	110
	Overload current rating *5		150% 60s, 200% 3s (inverse-time characteristics) surrounding air temperature 50°C														
	Rated voltage *6		Three-phase 380 to 480V														
	Regenerative braking torque	Maximum value/ permissible duty	100% torque/2%ED*6							20% torque/continuous *6				20% torque/continuous			
Power supply	Rated input AC voltage/frequency		Three-phase 380 to 480V 50Hz/60Hz														
	Permissible AC voltage fluctuation		323 to 528V 50Hz/60Hz														
	Permissible frequency fluctuation		±5%														
	Power supply capacity (kVA) *7		1.5	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80	100
Protective structure *9			Enclosed type (IP20) *9											Open type (IP00)			
Cooling system			Self-cooling			Forced air cooling											
Approx. mass (kg)			3.8	3.8	3.8	3.8	3.8	7.1	7.1	7.5	7.5	13	13	23	35	35	37

Model FR-A740-□□K			75	90	110	132	160	185	220	250	280	315	355	400	450	500
Applicable motor capacity (kW) *1			75	90	110	132	160	185	220	250	280	315	355	400	450	500
Output	Rated capacity (kVA) *2		110	137	165	198	248	275	329	367	417	465	521	587	660	733
	Rated current (A)*3		144 (122)	180 (153)	216 (184)	260 (221)	325 (276)	361 (307)	432 (367)	481 (409)	547 (465)	610 (519)	683 (581)	770 (655)	866 (736)	962 (818)
	Overload current rating *4		150% 60s, 200% 3s (inverse-time characteristics) surrounding air temperature 50°C													
	Rated voltage*5		Three-phase 380 to 480V													
	Regenerative braking torque	Maximum value/ permissible duty	10% torque/continuous													
Power supply	Rated input AC voltage/frequency		Three-phase 380 to 480V 50Hz/60Hz													
	Permissible AC voltage fluctuation		323 to 528V 50Hz/60H													
	Permissible frequency fluctuation		±5%													
	Power supply capacity (kVA) *7		110	137	165	198	248	275	329	367	417	465	521	587	660	733
Protective structure (JEM 1030) *9			Open type (IP00)													
Cooling system			Forced air cooling													
Approx. mass (kg)			50	57	72	72	110	110	175	175	175	260	260	370	370	370

*1. The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.
*2. The rated output capacity indicated assumes that the output voltage is 440V.
*3. When operating the inverter of 75K or higher with a value larger than 2kHz set in *Pr. 72 PWM frequency selection*, the rated output current is the value in parenthesis.
*4. The % value of the overload current rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.
*5. The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.
*6. With the dedicated external brake resistor FR-ABR-H (option), the 0.4K to 7.5K and 11K to 22K will achieve the performance of 100% torque/10%ED and 100% torque/6%ED respectively.
*7. The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).
*8. When the hook of the inverter front cover is cut off for installation of the plug-in option, protective structure of the inverter changes to an open type (IP00).
*9. FR-DU07:IP40 (except for the PU connector)

6.2 Motor rating

(1) SF-V5RU

●200V class (Mitsubishi dedicated motor [SF-V5RU (1500r/min series)])

Motor type SF-V5RU□□K		1	2	3	5	7	11	15	18	22	30	37	45	55
Applicable inverter model FR-A720-□□K		2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
Rated output (kW)		1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30 *1	37 *1	45 *1	55
Rated torque (N•m)		9.55	14.1	23.6	35.0	47.7	70.0	95.5	118	140	191	235	286	350
Maximum torque 150% 60s (N•m)		14.3	21.1	35.4	52.4	71.6	105	143	176	211	287	353	429	525
Rated speed (r/min)		1500												
Maximum speed (r/min)		3000 *2												2400
Frame No.		90L	100L	112M	132S	132M	160M	160L	180M	180M	200L	200L	200L	225S
Inertia moment J ($\times 10^{-4}$kg•m^2)		67.5	105	175	275	400	750	875	1725	1875	3250	3625	3625	6850
Noise *5		75dB or less									80dB or less			85dB or less
Cooling fan (with thermal protector) *7	Voltage	Single-phase 200V/50Hz Single-phase 200V to 230V/60Hz					Three-phase 200V/50Hz Three-phase 200 to 230V/60Hz							
	Input *3	36/55W (0.26/0.32A)			22/28W (0.11/0.13A)		55/71W (0.39/0.39A)				100/156W (0.47/0.53A)			85/130W (0.46/0.52A)
Surrounding air temperature, humidity		-10 to +40°C (non-freezing), 90%RH or less (non-condensing)												
Structure (Protective structure)		Totally enclosed forced draft system (Motor: IP44, cooling fan: IP23S) *4												
Detector		Encoder 2048P/R, A phase, B phase, Z phase +12VDC power supply *6												
Equipment		Encoder, thermal protector, fan												
Heat resistance class		F												
Vibration rank		V10												
Approx. mass (kg)		24	33	41	52	62	99	113	138	160	238	255	255	320

●400V class (Mitsubishi dedicated motor [SF-V5RUH (1500r/min series)])

Motor type SF-V5RUH□□K		1	2	3	5	7	11	15	18	22	30	37	45	55
Applicable inverter model FR-A740-□□K		2.2	2.2	3.7	7.5	11	15	18.5	22	30	37	45	55	75
Rated output (kW)		1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30 *1	37 *1	45 *1	55
Rated torque (N•m)		9.55	14.1	23.6	35.0	47.7	70.0	95.5	118	140	191	235	286	350
Maximum torque 150% 60s (N•m)		14.3	21.1	35.4	52.4	71.6	105	143	176	211	287	353	429	525
Rated speed (r/min)		1500												
Maximum speed (r/min)		3000 *2												2400
Frame No.		90L	100L	112M	132S	132M	160M	160L	180M	180M	200L	200L	200L	225S
Inertia moment J ($\times 10^{-4}$kg•m^2)		67.5	105	175	275	400	750	875	1725	1875	3250	3625	3625	6850
Noise *5		75dB or less									80dB or less			85dB or less
Cooling fan (with thermal protector) *7	Voltage	Single-phase 200V/50Hz Single-phase 200V to 230V/60Hz					Three-phase 380 to 400V/50Hz Three-phase 400 to 460V/60Hz							
	Input *3	36/55W (0.26/0.32A)			22/28W (0.11/0.13A)		55/71W (0.19/0.19A)				100/156W (0.27/0.30A)			85/130W (0.23/0.26A)
Surrounding air temperature, humidity		-10 to +40°C (non-freezing), 90%RH or less (non-condensing)												
Structure (Protective structure)		Totally enclosed forced draft system (Motor: IP44, cooling fan: IP23S) *4												
Detector		Encoder 2048P/R, A phase, B phase, Z phase +12VDC power supply *6												
Equipment		Encoder, thermal protector, fan												
Heat resistance class		F												
Vibration rank		V10												
Approx. mass (kg)		24	33	41	52	62	99	113	138	160	238	255	255	320

*1 80% output in the high-speed range. (The output is reduced when the speed is 2400r/min or more. Contact us separately for details.)
*2 A dedicated motor of 3.7kW or less can be run at the maximum speed of 3600 r/min. Consult our sales office when using the motor at the maximum speed.
*3 Power (current) at 50Hz/60Hz.
*4 Since a motor with brake has a window for gap check, the protective structure of both the cooling fan section and brake section is IP20. S of IP23S is an additional code indicating the condition that protection from water intrusion is established only when a cooling fan is not operating.
*5 The value when high carrier frequency is set (*Pr.72* = 6, *Pr.240* = 0).
*6 The 12V power supply or the control terminal option (FR-A7PS) is required as the power supply for the encoder.
*7 The cooling fan is equipped with a thermal protector. The cooling fan stops when the coil temperature exceeds the specified value in order to protect the fan motor. A restrained cooling fan or degraded fan motor insulation could be causes for the rise in coil temperature.The cooling fan re-starts when the coil temperature drops to normal.

(2) SF-THY

Motor type			SF-THY							
Applicable inverter			FR-A720-□□K	FR-A740-□□K						
			90	90	110	132	160	185	220	280
Rated output (kW)			75	75	90	110	132	160	200	250
Rated torque(kgf·m)			48.7	48.7	58.4	71.4	85.7	103.9	129.9	162.3
(N·m)			477	477	572	700	840	1018	1273	1591
Maximum torque(kgf·m)			73.0	73.0	87.6	107.1	128.5	155.8	194.8	243.4
150%60s (N·m)			715	715	858	1050	1260	1527	1909	2386
Rated speed (r/min)			1500	1500						
Maximum speed (r/min)			2400	2400	1800					
Frame No.			250MD	250MD	250MD	280MD	280MD	280MD	280L	315H
Inertia moment J (kg·m^2)			1.1	1.1	1.7	2.3	2.3	4.0	3.8	5.0
Noise			90dB	90dB			95dB			
Cooling fan	Voltage		Three-phase, 200V/50Hz, 200V/60Hz, 220V/60Hz (400V class cooling fan is available upon order)							
	Input (W)	50Hz	750	400	400	400	400	400	750	750
		60Hz		750	750	750	750	750	1500	1500
Approx. mass (kg)			610	610	660	870	890	920	1170	1630
Common specifications	Surrounding air temperature, humidity		-10 to +40°C (non-freezing), 90%RH or less (non-condensing)							
	Structure		Totally enclosed forced draft system							
	Detector		Encoder 2048P/R, A phase, B phase, Z phase +12VDC power supply *1							
	Equipment		Encoder, thermal protector*2, fan							
	Insulation		Class F							
	Vibration rank		V10							
	Dedicated Encoder	Resolution	2048 pulse/rev							
		Power supply voltage	12VDC±10%							
		Current consumption	90mA							
		Output signal form	A, B phases (90° phase shift) Z phase: 1 pulse/rev							
		Output circuit	Complementary (constant voltage output matched by emitter follow)							
		Output voltage	"H" level: Power supply voltage 9V or more (I_{OH}: -20mA) "L" level: Power supply voltage 3V or less (I_{OL}: 20mA)							

*1 The 12V power supply or the control terminal option (FR-A7PS) is required as the power supply for the encoder.

*2 A motor with a thermal protector is also available. Contact your sales representative.

6.3 Common specifications

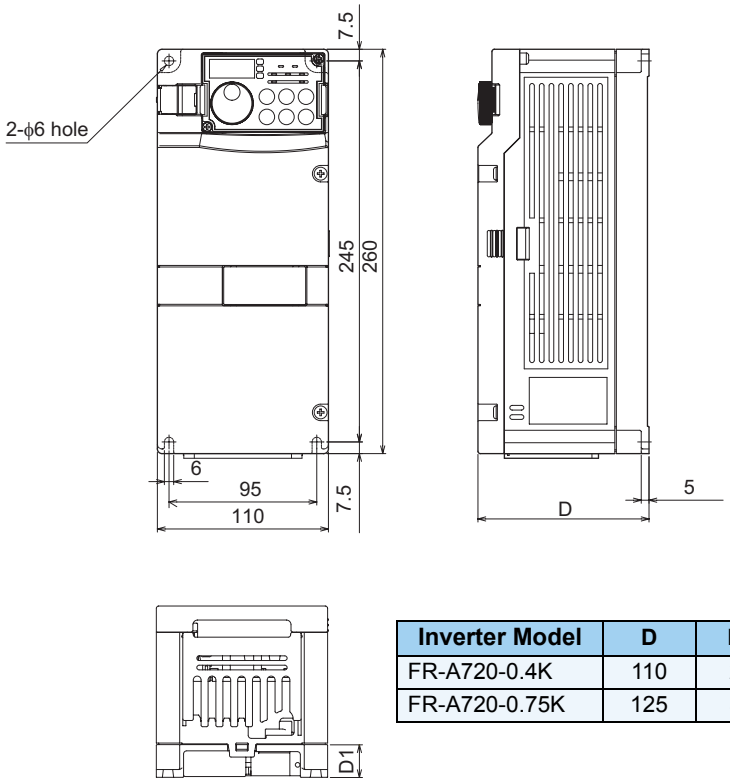
Control specifications	Control method		Soft-PWM control/high carrier frequency PWM control (V/F control, Advanced magnetic flux vector control and Real sensorless vector control are available) / vector control *1
	Output frequency range		0.2 to 400Hz (The maximum frequency is 120Hz under Real sensorless vector control and vector control*1.)
	Frequency setting resolution	Analog input	0.015Hz/60Hz (terminal 2, 4: 0 to 10V/12bit) 0.03Hz/60Hz (terminal 2, 4: 0 to 5V/11bit, 0 to 20mA/about 11bit, terminal 1: 0 to ±10V/12bit) 0.06Hz/60Hz (terminal 1: 0 to ±5V/11bit)
		Digital input	0.01Hz
	Frequency accuracy	Analog input	Within ±0.2% of the max. output frequency (25°C±10°C)
		Digital input	Within 0.01% of the set output frequency
	Voltage/frequency characteristics		Base frequency can be set from 0 to 400Hz Constant torque/variable torque pattern or adjustable 5 points V/F can be selected
	Starting torque		200% at 0.3Hz (0.4K to 3.7K), 150% at 0.3Hz (5.5K or higher) (under Real sensorless vector control or vector control *1)
	Torque boost		Manual torque boost
	Acceleration/deceleration time setting		0 to 3600s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration mode, backlash measures acceleration/deceleration mode are available.
	DC injection brake		Operation frequency (0 to 120Hz), operation time (0 to 10s), operation voltage (0 to 30%) can be changed
	Stall prevention operation level		Operation current level can be set (0 to 220% adjustable), whether to use the function or not can be selected
	Torque limit level		Torque limit value can be set (0 to 400% variable)
Operation specifications	Frequency setting signal	Analog input	• Terminal 2, 4: 0 to 10V, 0 to 5V, 4 to 20mA (0 to 20mA) can be selected• Terminal 1: -10 to +10V, -5 to +5V can be selected
		Digital input	Input using the setting dial of the operation panel or parameter unit Four-digit BCD or 16 bit binary (when used with option FR-A7AX)
	Start signal		Forward and reverse rotation or start signal automatic self-holding input (3-wire input) can be selected.
	Input signals (twelve terminals)		The following signals can be assigned to *Pr. 178 to Pr. 189 (input terminal function selection)*: multi speed selection, remote setting, stop-on-contact, second function selection, third function selection, terminal 4 input selection, JOG operation selection, selection of automatic restart after instantaneous power failure, flying start, external thermal relay input, inverter run enable signal (FR-HC/FR-CV connection), FR-HC connection (instantaneous power failure detection), PU operation/external inter lock signal, external DC injection brake operation start, PID control enable terminal, brake opening completion signal, PU operation/External operation switchover, load pattern selection forward rotation reverse rotation boost, V/F switching, load torque high-speed frequency, S-pattern acceleration/deceleration C switchover, pre-excitation, output stop, start self-holding selection, control mode changing, torque limit selection, start-time tuning start external input, torque bias selection 1, 2*1, P/PI control switchover, forward rotation command, reverse rotation command, inverter reset, PTC thermistor input, PID forward reverse operation switchover, PU-NET operation switchover, NET-External operation switchover, command source switchover, simple position pulse train sign*1, simple position droop pulse clear*1, DC feeding operation permission, DC feeding cancel, magnetic flux decay output shutoff, proximity dog *3.
	Pulse train input		100kpps
	Operational functions		Maximum/minimum frequency setting, frequency jump operation, external thermal relay input selection, polarity reversible operation, automatic restart after instantaneous power failure operation, electronic bypass operation, forward/reverse rotation prevention, remote setting, brake sequence, second function, third function, multi-speed operation, original operation continuation at instantaneous power failure, stop-on-contact control, load torque high speed frequency control, droop control, regeneration avoidance, slip compensation, operation mode selection, offline auto tuning function, online auto tuning function, PID control, computer link operation (RS-485), motor end orientation *1, machine end orientation *2, pre-excitation, notch filter, machine analyzer *1, easy gain tuning, speed feed forward, and torque bias *1
	Output signals Open collector output (5 terminals) Relay output (2 terminals)		The following signals can be assigned to *Pr. 190 to Pr. 196 (output terminal function selection)*: inverter running, inverter running/start command on, up-to-frequency, instantaneous power failure/undervoltage, overload warning, output frequency (speed) detection, second output frequency (speed) detection, third output frequency (speed) detection, regenerative brake prealarm, electronic thermal relay function pre-alarm, PU operation mode, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward rotation reverse rotation output, electronic bypass MC1, electronic bypass MC2, electronic bypass MC3, orientation complete *1, orientation fault *1, brake opening request, fan fault output, heatsink overheat pre-alarm, deceleration at an instantaneous power failure, PID control activated, motor temperature detection *4, during retry, PID output interruption, position control preparation ready *1, DC feeding, life alarm, fault output 1, 2, 3 (power-off signal), power savings average value update timing, current average monitor, maintenance timer alarm, remote output, forward rotation output *1, reverse rotation output *1, low speed output, torque detection, regenerative status output *1, start-time tuning completion, in-position completion *1, alarm output and fault output. Alarm code of the inverter can be output (4 bit) from the open collector.
	Operating status		
	When used with the FR-A7AY, FR-A7AR (option)		In addition to above, the following signal can be assigned to *Pr.313 to Pr. 319 (extension output terminal function selection)*: control circuit capacitor life, main circuit capacitor life, cooling fan life, inrush current limit circuit life. (only positive logic can be set for extension terminals of the FR-A7AR)
	Pulse train output		50kpps
	For meter Pulse train output (Max. 2.4kHz: one terminal) Analog output (Max. 10VDC: one terminal)		The following signals can be assigned to *Pr. 54 FM terminal function selection (pulse train output)* and *Pr. 158 AM terminal function selection (analog output)*: output frequency, motor current (steady or peak value), output voltage, frequency setting, operation speed, motor torque, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, reference voltage output, motor load factor, motor temperature *4, power saving effect, regenerative brake duty, PID set point, PID measured value, motor output, torque command, torque current command, and torque monitor.
Indication	Operation panel (FR-DU07) Parameter unit (FR-PU07)	Operating status	The following operating status can be displayed: Output frequency, motor current (steady or peak value), output voltage, frequency setting, running speed, motor torque, overload, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, position pulse *5, cumulative energization time, orientation status *1, actual operation time, motor load factor, cumulative power, energy saving effect, cumulative saving power, regenerative brake duty, PID set point, PID measured value, PID deviation, inverter I/O terminal monitor, input terminal option monitor*5, output terminal option monitor *5, option fitting status *6, terminal assignment status *6, torque command, torque current command, feed back pulse *1, motor output, SSCNET III communication status *3, motor temperature *4
		Fault record	Fault definition is displayed when a fault occurs, the output voltage/current/frequency/cumulative energization time right before the fault occurs and past 8 fault records are stored.
		Interactive guidance	Function (help) for operation guide *6
Protective/ warning function		Protective function	Overcurrent during acceleration, overcurrent during constant speed, overcurrent during deceleration, overvoltage during acceleration, overvoltage during constant speed, overvoltage during deceleration, inverter protection thermal operation, motor protection thermal operation, heatsink overheat, instantaneous power failure occurrence, undervoltage, input phase loss *9, motor overload, output side earth (ground) fault overcurrent, output short circuit, main circuit element overheat, output phase loss, external thermal relay operation *9, PTC thermistor operation *9, option fault, parameter error, PU disconnection, retry count excess *9, CPU fault, operation panel power supply short circuit, 24VDC power output short circuit, output current detection value excess *9, inrush current limit circuit fault, communication fault (inverter), USB fault, opposite rotation deceleration fault*9, analog input fault, brake transistor alarm, speed deviation large *1*9, overspeed *1*9, position error large *1*9, signal loss detection *1*9, brake sequence fault*9, encoder phase error *1*9
		Warning function	Fan fault, overcurrent stall prevention, overvoltage stall prevention, regenerative brake prealarm *9, electronic thermal relay function prealarm, PU stop, maintenance timer alarm *9, parameter write error, copy operation error, operation panel lock, password locked, parameter copy alarm, speed limit indication
Environment	Surrounding air temperature		-10°C to +50°C (non-freezing)
	Ambient humidity		90%RH maximum (non-condensing)
	Storage temperature *7		-20°C to +65°C
	Atmosphere		Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt etc.)
	Altitude/vibration		Maximum 1000m above sea level for standard operation. 5.9m/s^2 or less *8 at 10 to 55Hz (directions of X, Y, Z axes)

*1 Available only when the option (FR-A7AP/FR-A7AL) is mounted.
*2 Available only when the option (FR-A7AL) is mounted.
*3 Available only when the option (FR-A7NS) is mounted.
*4 Available only when the option (FR-A7AZ) is mounted and SF-V5RU□□□□□T/A is used.
*5 Can be displayed only on the operation panel (FR-DU07).
*6 Can be displayed only on the parameter unit (FR-PU07).
*7 Temperature applicable for a short period in transit, etc.
*8 2.9m/s^2 or less for the 160K or higher.
*9 This protective function is not available in the initial status.

6.4 Outline dimension drawings

6.4.1 Inverter outline dimension drawings

● FR-A720-0.4K, 0.75K

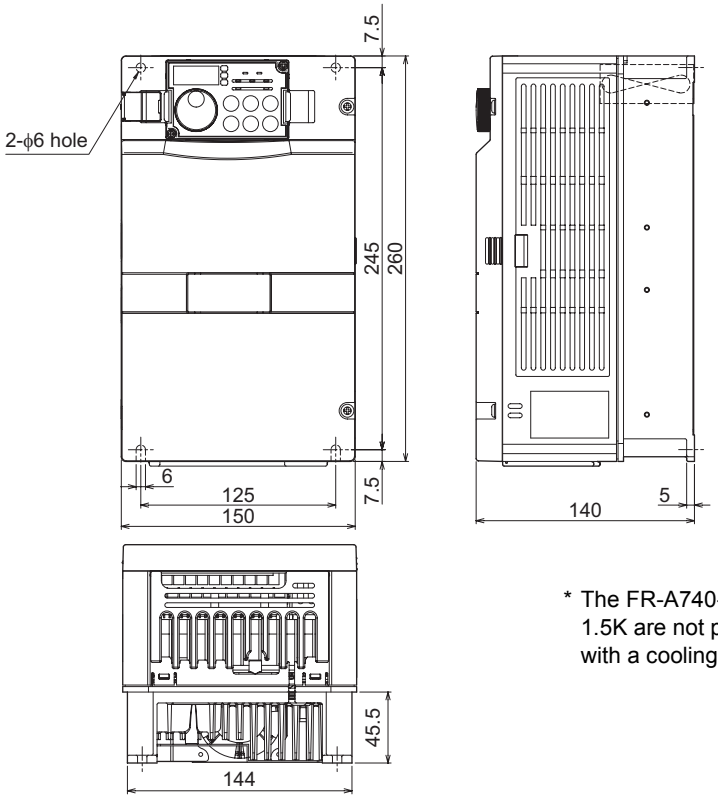


Inverter Model	D	D1
FR-A720-0.4K	110	21
FR-A720-0.75K	125	36

(Unit: mm)

●FR-A720-1.5K, 2.2K, 3.7K

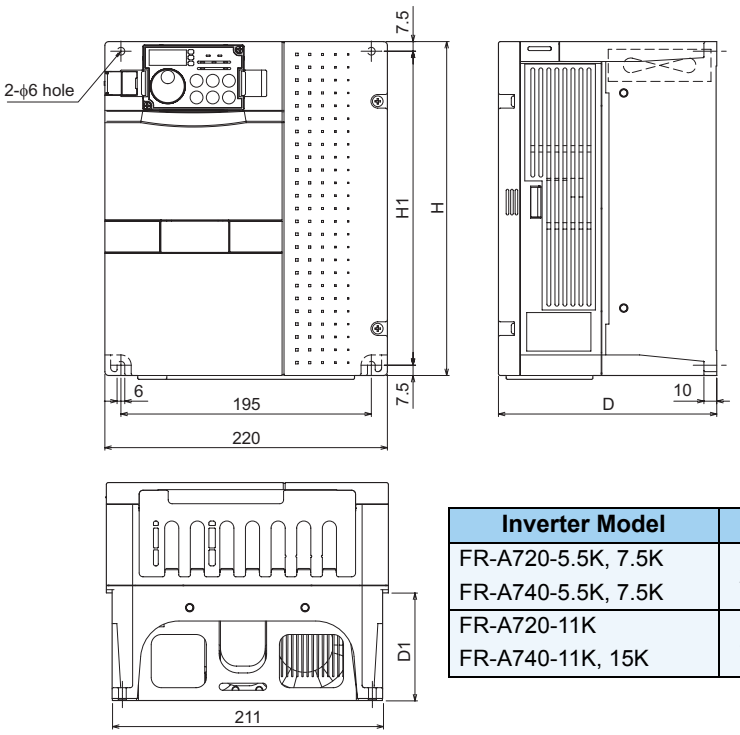
●FR-A740-0.4K, 0.75K, 1.5K, 2.2K, 3.7K



* The FR-A740-0.4K to 1.5K are not provided with a cooling fan.

(Unit: mm)

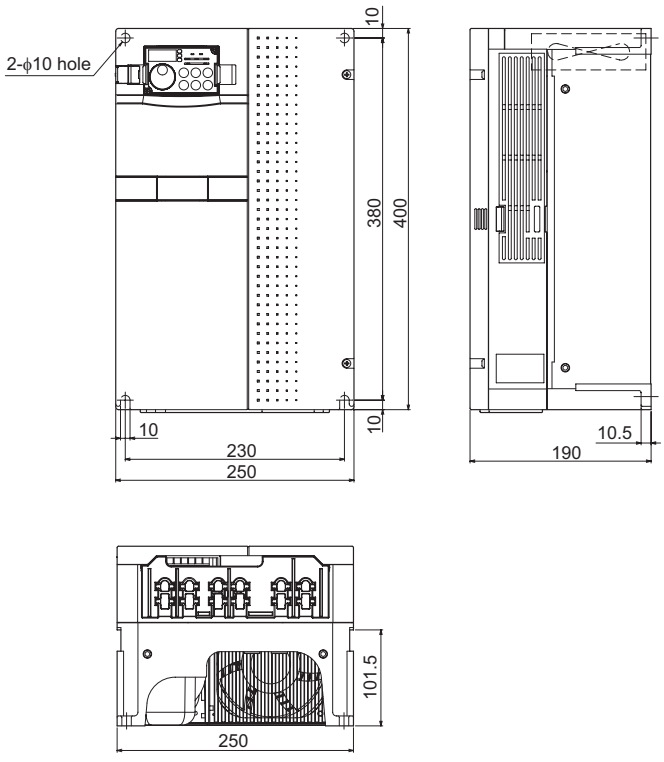
●FR-A720-5.5K, 7.5K, 11K
●FR-A740-5.5K, 7.5K, 11K, 15K



Inverter Model	H	H1	D	D1
FR-A720-5.5K, 7.5K FR-A740-5.5K, 7.5K	260	245	170	84
FR-A720-11K FR-A740-11K, 15K	300	285	190	101.5

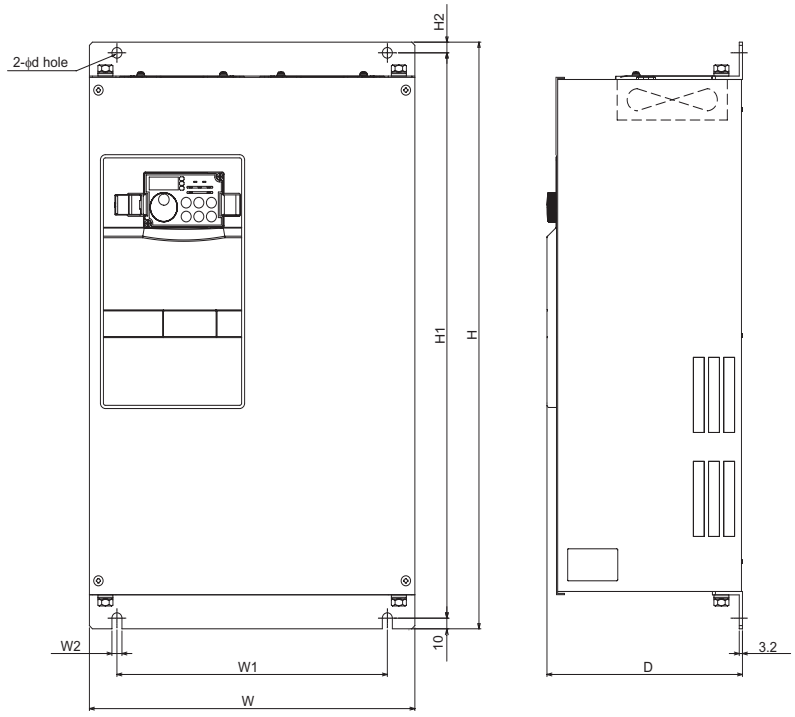
(Unit: mm)

●FR-A720-15K, 18.5K, 22K
●FR-A740-18.5K, 22K



(Unit: mm)

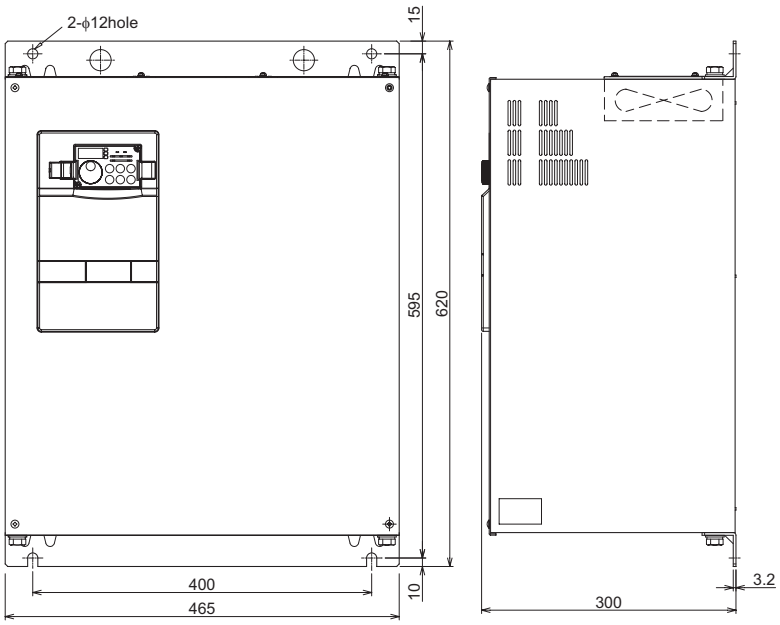
●FR-A720-30K, 37K, 45K, 55K
●FR-A740-30K, 37K, 45K, 55K



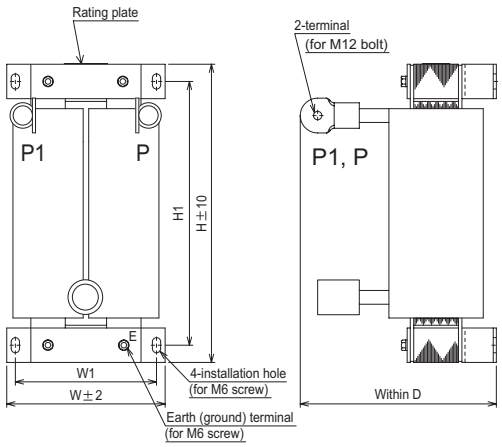
Inverter Model	W	W1	W2	H	H1	H2	d	D
FR-A720-30K FR-A740-30K	325	270	10	550	530	10	10	195
FR-A720-37K, 45K FR-A740-37K, 45K, 55K	435	380	12	550	525	15	12	250
FR-A720-55K	465	410	12	700	675	15	12	250

(Unit: mm)

●FR-A740-75K, 90K



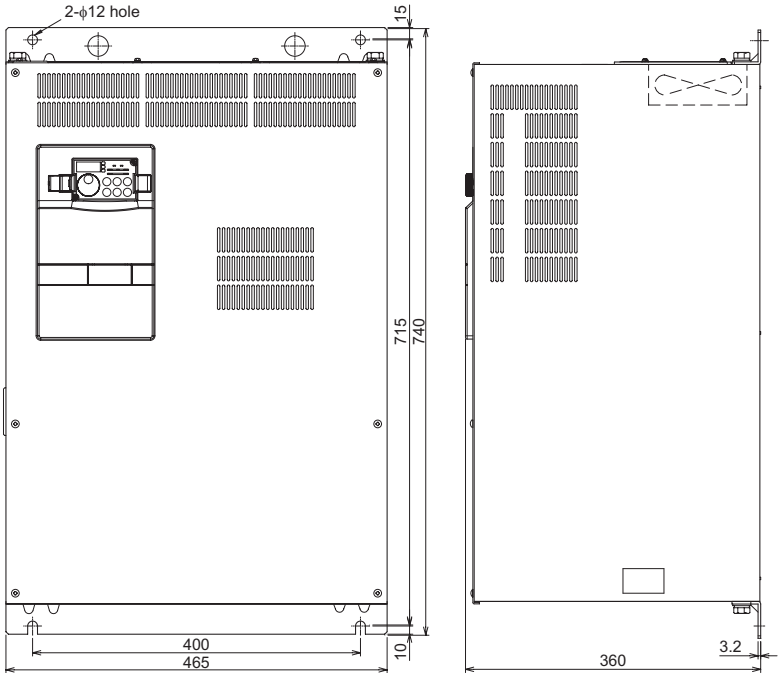
●DC reactor supplied



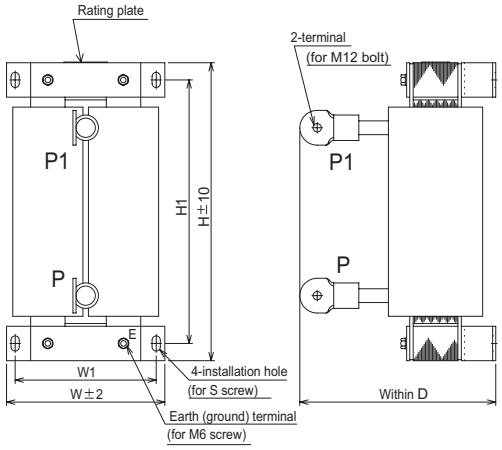
DC Reactor Model	W	W1	H	H1	D	Mass (Kg)
FR-HEL-H75K (FR-A740-75K)	140	120	320	295	185	16
FR-HEL-H90K (FR-A740-90K)	150	130	340	310	190	20

(Unit: mm)

●FR-A720-75K, 90K
●FR-A740-110K, 132K



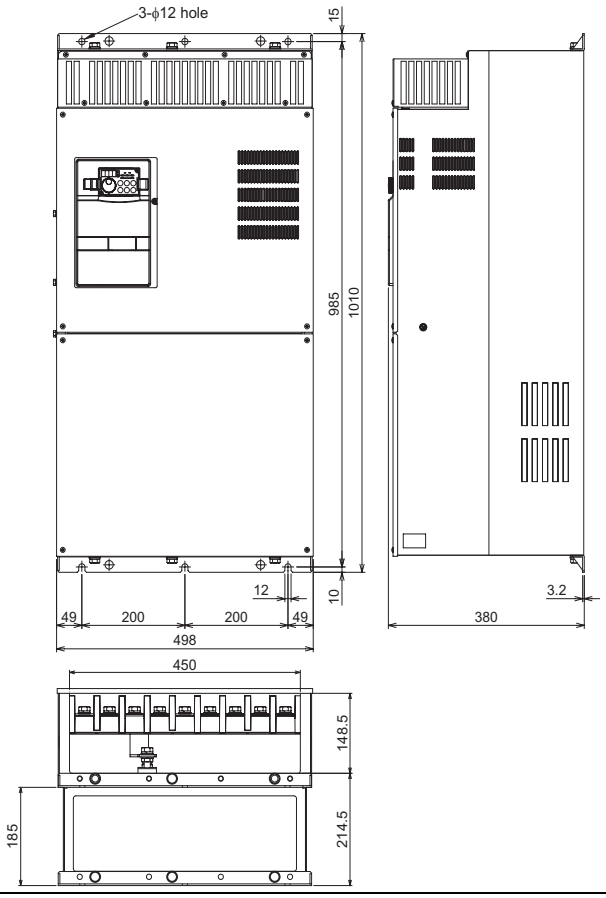
●DC reactor supplied



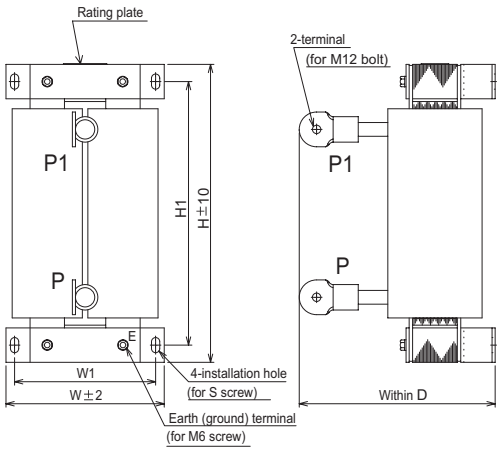
DC Reactor Model	W	W1	H	H1	D	S	Mass (kg)
FR-HEL-75K (FR-A720-75K)	150	130	340	310	190	M6	17
FR-HEL-90K (FR-A720-90K)	150	130	340	310	200	M6	19
FR-HEL-H110K (FR-A740-110K)	150	130	340	310	195	M6	22
FR-HEL-H132K (FR-A740-132K)	175	150	405	370	200	M8	26

(Unit: mm)

●FR-A740-160K, 185K



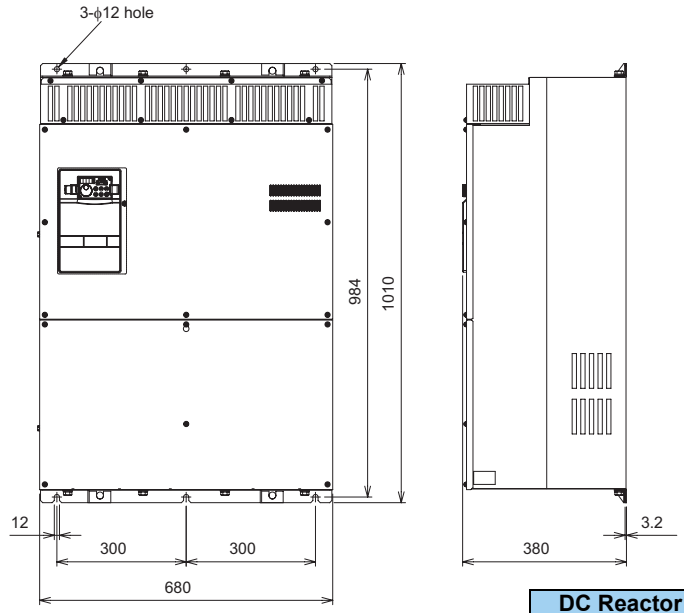
●DC reactor supplied



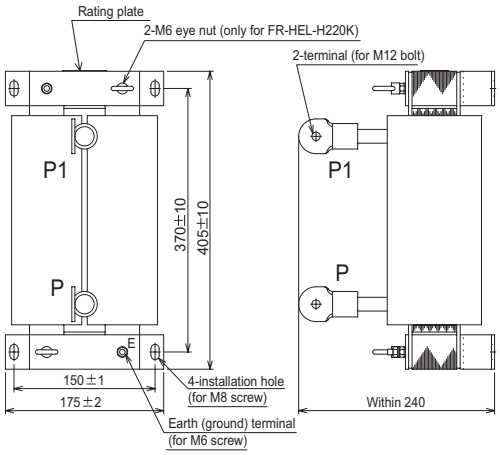
DC Reactor Model	W	W1	H	H1	D	S	Mass (kg)
FR-HEL-H160K (FR-A740-160K)	175	150	405	370	205	M8	28
FR-HEL-H185K (FR-A740-185K)	175	150	405	370	240	M8	29

(Unit: mm)

●FR-A740-220K, 250K, 280K



●DC reactor supplied

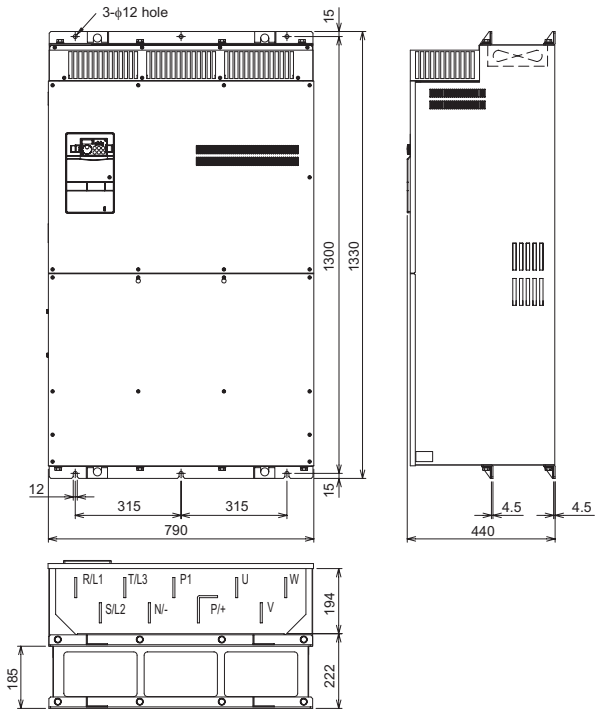


* Remove the eye nut after installation of the product.

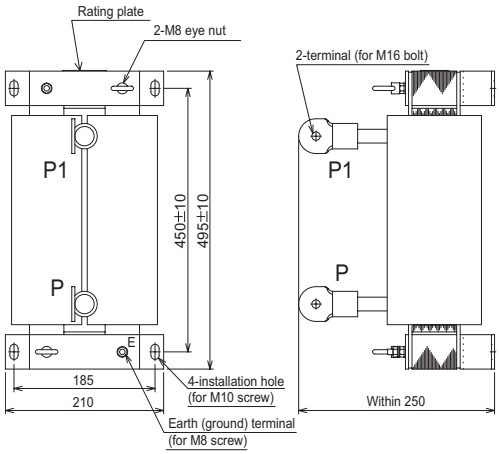
DC Reactor Model	W	W1	H	H1	D	S	S1	S2	φ	Mass (kg)
FR-HEL-H220K (FR-A740-220K)	175	150	405	370	240	M8	M6	M6	M12	30
FR-HEL-H250K (FR-A740-250K)	190	165	440	400	250	M8	M8	M8	M12	35
FR-HEL-H280K (FR-A740-280K)	190	165	440	400	255	M8	M8	M8	M16	38

(Unit: mm)

●FR-A740-315K, 355K



●DC reactor supplied

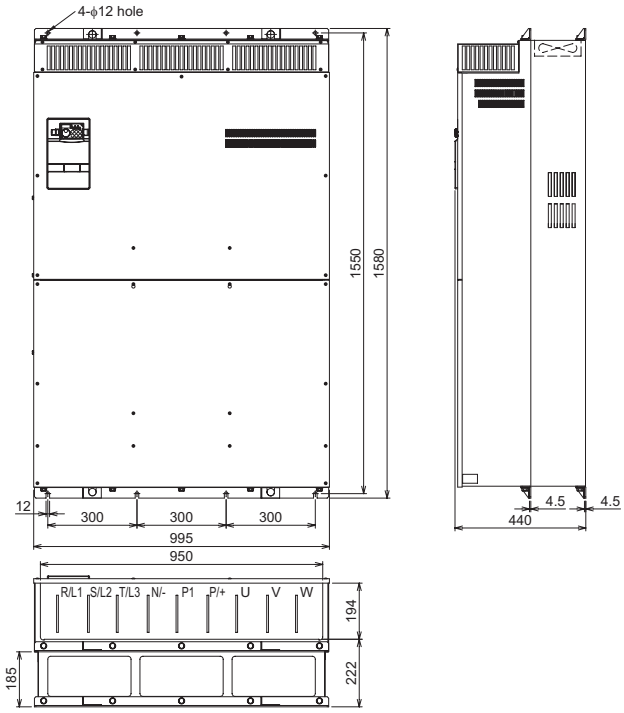


* Remove the eye nut after installation of the product.

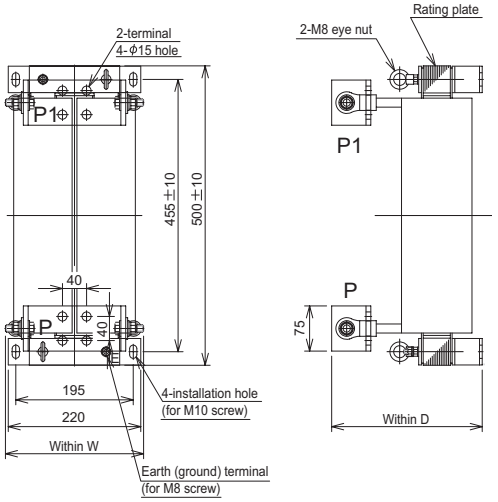
DC Reactor Model	Mass (kg)
FR-HEL-H315K (FR-A740-315K)	42
FR-HEL-H355K (FR-A740-355K)	46

(Unit: mm)

●FR-A740-400K, 450K, 500K



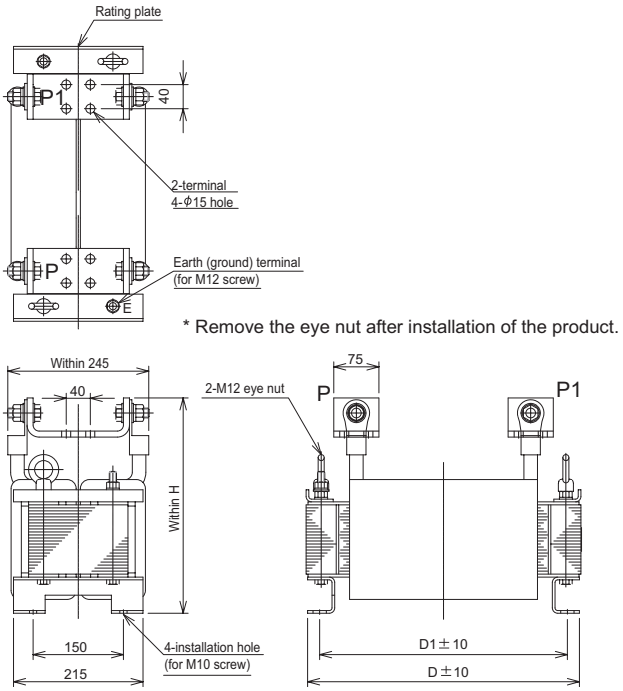
●DC reactor supplied



* Remove the eye nut after installation of the product.

DC Reactor Model	W	D	Mass (kg)
FR-HEL-H400K (FR-A740-400K)	235	250	50
FR-HEL-H450K (FR-A740-450K)	240	270	57

●DC reactor supplied



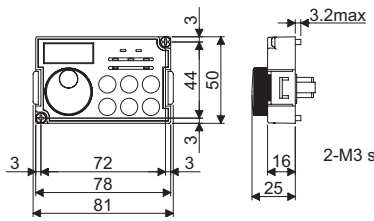
* Remove the eye nut after installation of the product.

DC Reactor Model	H	D	D1	Mass (kg)
FR-HEL-H500K (FR-A740-500K)	345	455	405	67

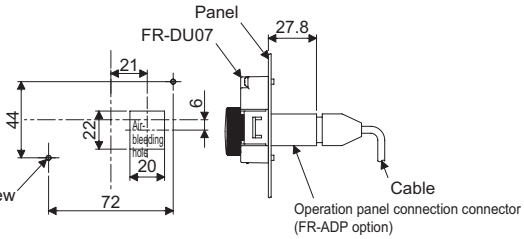
(Unit: mm)

● Operation panel (FR-DU07)

<Outline drawing>



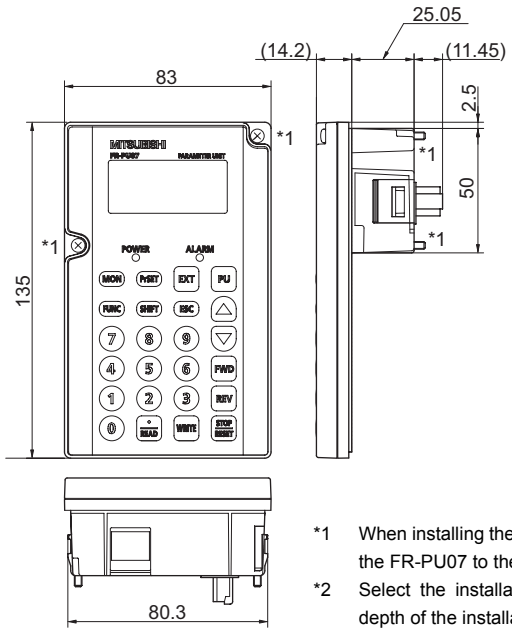
<Panel cutting dimension drawing>



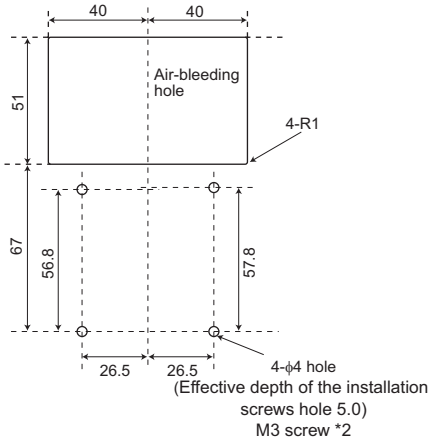
(Unit: mm)

● Parameter unit (option) (FR-PU07)

<Outline drawing>



<Panel cutting dimension drawing>



*1 When installing the FR-PU07 on the enclosure, etc., remove screws for fixing the FR-PU07 to the inverter or fix the screws to the FR-PU07 with M3 nuts.

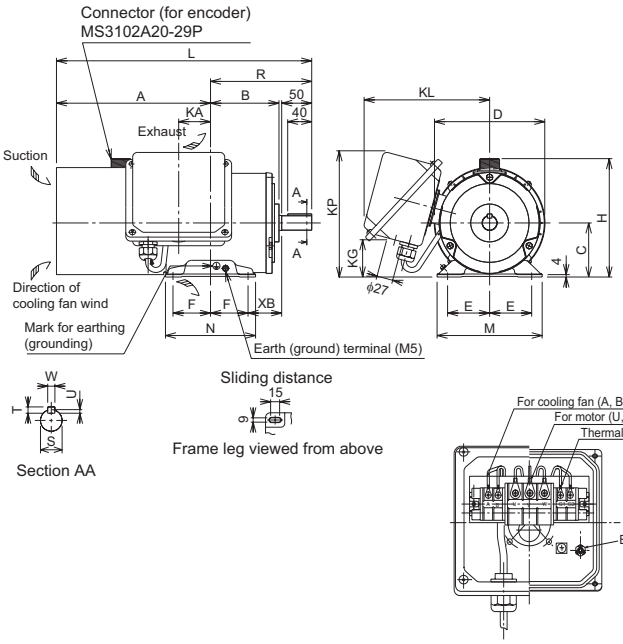
*2 Select the installation screws whose length will not exceed the effective depth of the installation screw hole.

(Unit: mm)

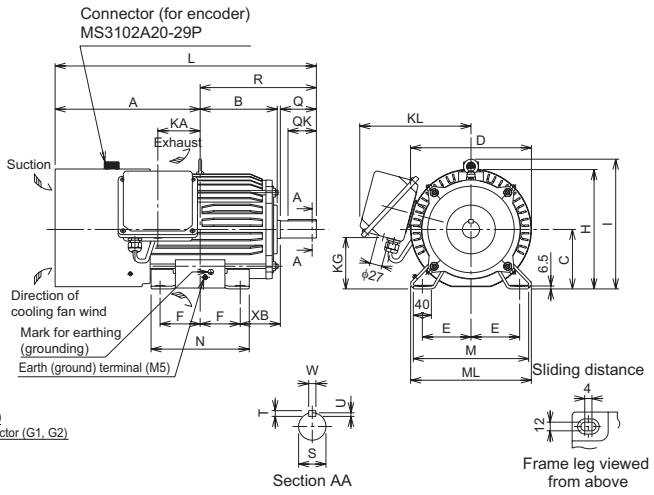
6.4.2 Dedicated motor outline dimension drawings

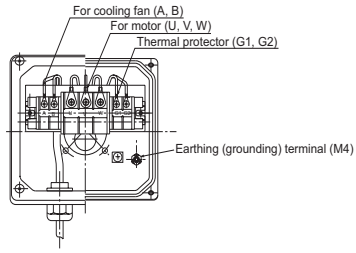
Dedicated motor (SF-V5RU(H)) outline dimension drawings (standard horizontal type)

Frame Number 90L
SF-V5RU(H) 1K

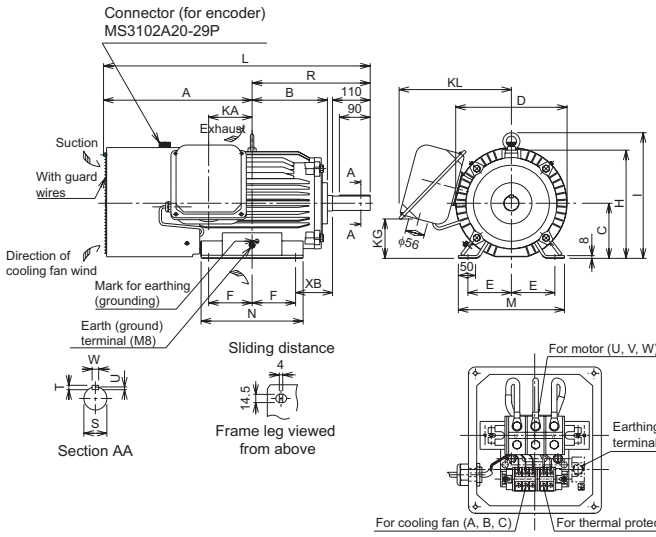


Frame Number 100L, 112M, 132S, 132M
SF-V5RU(H) 2K , 3K , 5K , 7K

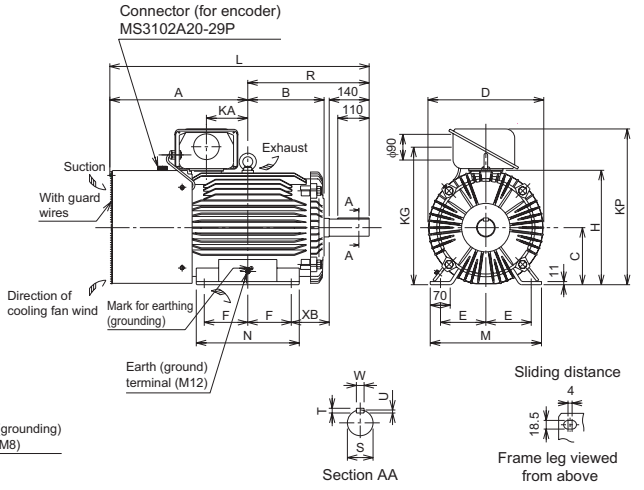




Frame Number 160M, 160L, 180M, 180L
SF-V5RU(H) 11K , 15K , 18K , 22K



Frame Number 200L, 225S
SF-V5RU(H) 30K , 37K , 45K , 55K



Make sure to earth the earth terminal of the frame installation foot as well as the earth terminal in the terminal box.

Dimensions table

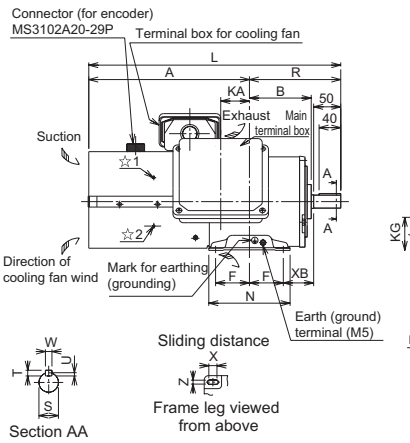
(Unit: mm)

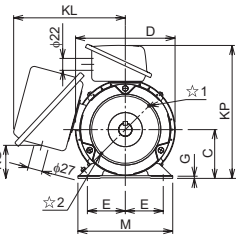
SF-V5RU □K	SF-V5RU □K1	SF-V5RU □K3	SF-V5RU □K4	Frame No.	Mass (kg)	Motor																						Terminal Screw Size		
						A	B	C	D	E	F	H	I	KA	KG	KL(KP)	L	M	ML	N	XB	Q	QK	R	S	T	U	W	U,V,W	A,B,(C)	G1,G2
1	—	—	—	90L	24	256.5	114	90	183.6	70	62.5	198	—	53	65	220(210)	425	175	—	150	56	—	—	168.5	24j6	7	4	8	M6	M4	M4
2	1	—	—	100L	33	284	128	100	207	80	70	203.5	230	65	78	231	477	200	212	180	63	60	45	193	28j6	7	4	8	M6	M4	M4
3	2	1	—	112M	41	278	135	112	228	95	70	226	253	69	93	242	478	230	242	180	70	60	45	200	28j6	7	4	8	M6	M4	M4
5	3	2	—	132S	52	303	152	132	266	108	70	265	288	75	117	256	542	256	268	180	89	80	63	239	38k6	8	5	10	M6	M4	M4
7	5	3	1	132M	62	322	171	132	266	108	89	265	288	94	117	256	580	256	268	218	89	80	63	258	38k6	8	5	10	M6	M4	M4
11	7	5	2	160M	99	412	198	160	318	127	105	316	367	105	115	330	735	310	—	254	108	—	—	323	42k6	8	5	12	M8	M4	M4
15	11	7	3	160L	113	434	220	160	318	127	127	316	367	127	115	330	779	310	—	298	108	—	—	345	42k6	8	5	12	M8	M4	M4
18	—	—	—	180M	138	438.5	225.5	180	363	139.5	120.5	359	410	127	139	352	790	335	—	285	121	—	—	351.5	48k6	9	5.5	14	M8	M4	M4
22	15	11	—		160																									
—	18	15	5	180L	200	457.5	242.5	180	363	139.5	139.5	359	410	146	139	352	828	335	—	323	121	—	—	370.5	55m6	10	6	16	M8	M4	M4
30	—	—	7	200L	238	483.5	267.5	200	406	159	152.5	401	—	145	487	(546)	909	390	—	361	133	—	—	425.5	60m6	11	7	18	M10	M4	M4
37, 45	22, 30	18, 22	—		255																									
55	37	30	11, 15	225S	320	500	277	225	446	178	143	446	—	145	533	(592)	932	428	—	342	149	—	—	432	65m6	11	7	18	M10	M4	M4

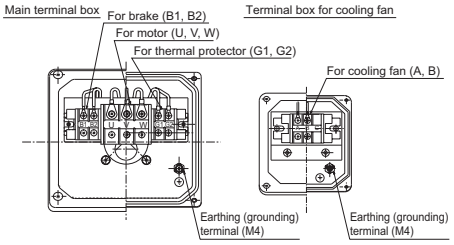
Note) 1. Install the motor on the floor and use it with the shaft horizontal.
2. Leave an enough clearance between the fan suction port and wall to ensure adequate cooling.
Also, check that the ventilation direction of a fan is from the opposite load side to the load side.
3 The size difference of top and bottom of the shaft center height is $^{0}_{-0.5}$
4 The 400V class motor has -H at the end of its type name.

Dedicated motor (SF-V5RU(H)) outline dimension drawings (standard horizontal type with brake)

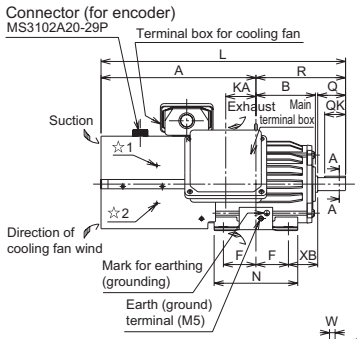
Frame Number 90L
SF-V5RU(H) 1KB

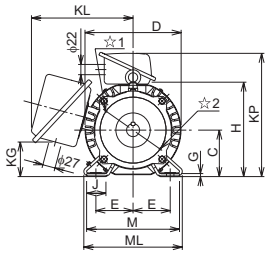


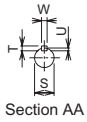




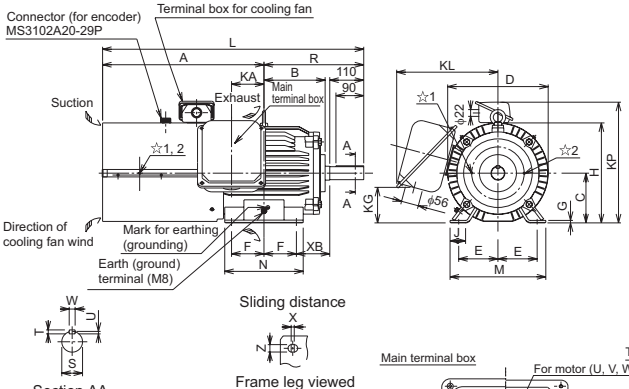
Frame Number 100L, 112M, 132S, 132M
SF-V5RU(H) 2KB, 3KB, 5KB, 7KB

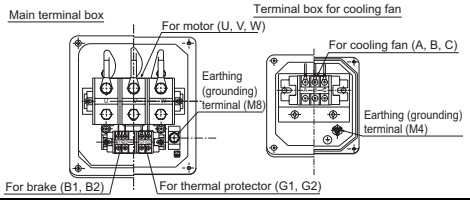




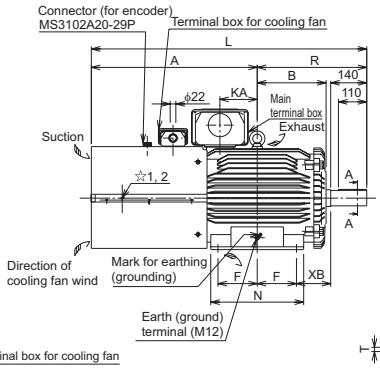


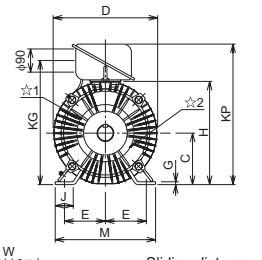
Frame Number 160M, 160L, 180M, 180L
SF-V5RU(H) 11KB, 15KB, 18KB, 22KB





Frame Number 200L, 225S
SF-V5RU(H) 30KB, 37KB, 45KB, 55KB





☆ indicates an inserting position of a bolt with hex head holes for manual opening.
Make sure to earth the earth terminal of the frame installation foot as well as the earth terminal in the terminal box.

Dimensions table

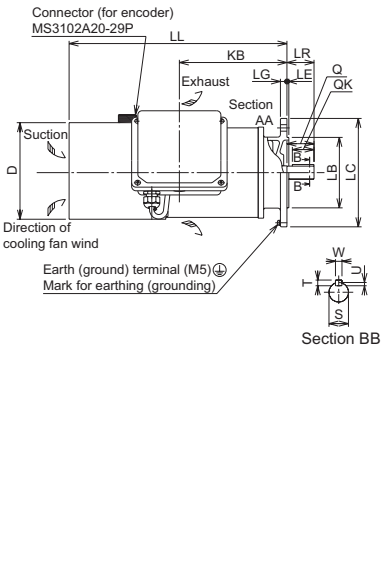
(Unit: mm)

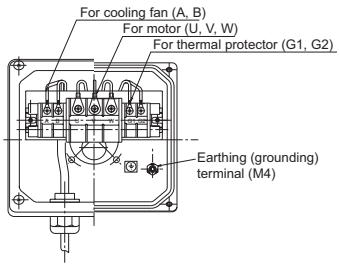
SF-V5RU □KB	SF-V5RU □K1B	SF-V5RU □K3B	SF-V5RU □K4B	Frame No.	Mass (kg)	Motor																					Shaft End							Terminal Screw Size			
						A	B	C	D	E	F	G	H	I	J	KA	KD	KG	KL	KP	L	M	ML	N	X	XB	Z	Q	QK	R	S	T	U	W	U,V,W	A,B,(C)	G1,G2	B1,B2
1	—	—	—	90L	29	296.5	114	90	183.6	70	62.5	4	—	—	—	53	27	65	220	245	465	175	—	150	15	56	9	50	40	168.5	24j6	7	4	8	M6	M4	M4	M4
2	1	—	—	100L	46	333.5	128	100	207	80	70	6.5	—	—	40	65	27	78	231	265	526.5	200	212	180	4	63	12	60	45	193	28j6	7	4	8	M6	M4	M4	M4
3	2	1	—	112M	53	355	135	112	228	95	70	6.5	—	—	40	69	27	93	242	290	555	230	242	180	4	70	12	60	45	200	28j6	7	4	8	M6	M4	M4	M4
5	3	2	—	132S	70	416	152	132	266	108	70	6.5	—	—	40	75	27	117	256	329	655	256	268	180	4	89	12	80	63	239	38k6	8	5	10	M6	M4	M4	M4
7	5	3	1	132M	80	435	171	132	266	108	89	6.5	—	—	40	94	27	117	256	329	693	256	268	218	4	89	12	80	63	258	38k6	8	5	10	M6	M4	M4	M4
11	7	5	2	160M	140	522.5	198	160	318	127	105	8	—	—	50	105	56	115	330	391	845.5	310	—	254	4	108	14.5	110	90	323	42k6	8	5	12	M8	M4	M4	M4
15	11	7	3	160L	155	544.5	220	160	318	127	127	8	—	—	50	127	56	115	330	391	889.5	310	—	298	4	108	14.5	110	90	345	42k6	8	5	12	M8	M4	M4	M4
18	—	—	—	180M	185	568.5	225.5	180	363	139.5	120.5	8	—	—	50	127	56	139	352	428	920	335	—	285	4	121	14.5	110	90	351.5	48k6	9	5.5	14	M8	M4	M4	M4
22	15	11	—		215																																	
—	18	15	5	180L	255	587.5	242.5	180	363	139.5	139.5	8	—	—	50	146	56	139	352	428	958	335	—	323	4	121	14.5	110	90	370.5	55m6	10	6	16	M8	M4	M4	M4
30	—	—	7	200L	305	644.5	267.5	200	406	159	152.5	11	—	—	70	145	90	487	—	546	1070	390	—	361	4	133	18.5	140	110	425.5	60m6	11	7	18	M10	M4	M4	M4
37, 45	22, 30	18, 22	—		330																																	
55	37	30	11, 15	225S	395	659	277	225	446	178	143	11	—	—	70	145	90	533	—	592	1091	428	—	342	4	149	18.5	140	110	432	65m6	11	7	18	M10	M4	M4	M4

Note) 1. Install the motor on the floor and use it with the shaft horizontal.
2. Leave an enough clearance between the fan suction port and wall to ensure adequate cooling.
Also, check that the ventilation direction of a fan is from the opposite load side to the load side.
3 The size difference of top and bottom of the shaft center height is $^{0}_{-0.5}$
4 The 400V class motor has -H at the end of its type name.
5. Since a brake power device is a stand-alone, install it inside the enclosure.
(This device should be arranged at the customer side.)

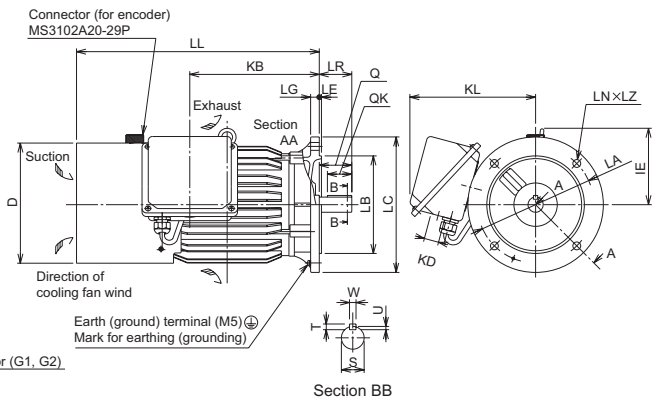
Dedicated motor (SF-V5RU(H)) outline dimension drawings (flange type)

Frame Number 90L
SF-V5RUF(H) 1K

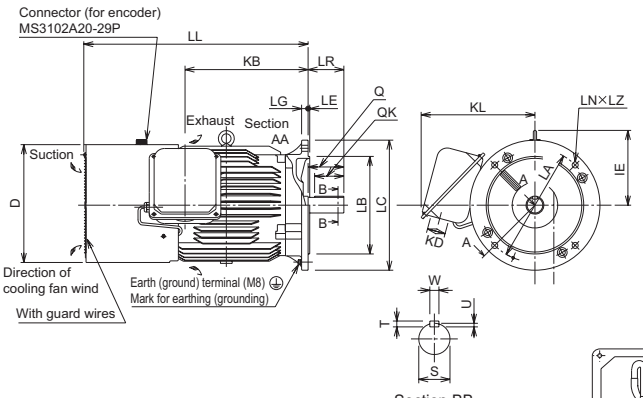


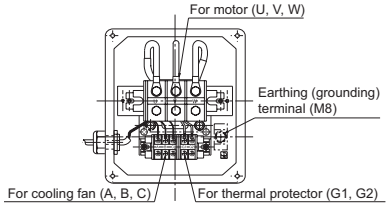


Frame Number 100L, 112M, 132S, 132M
SF-V5RUF(H) 2K , 3K , 5K , 7K

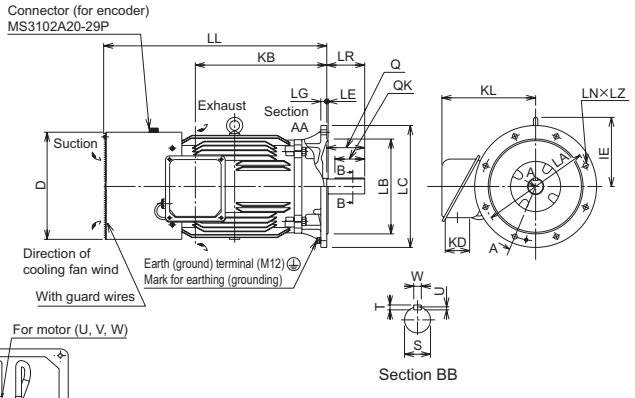


Frame Number 160M, 160L, 180M, 180L
SF-V5RUF(H) 11K , 15K , 18K , 22K





Frame Number 200L
SF-V5RUF(H) 30K , 37K , 45K



Make sure to earth the earth terminal of the flange section as well as the earth terminal in the terminal box.

Dimensions table

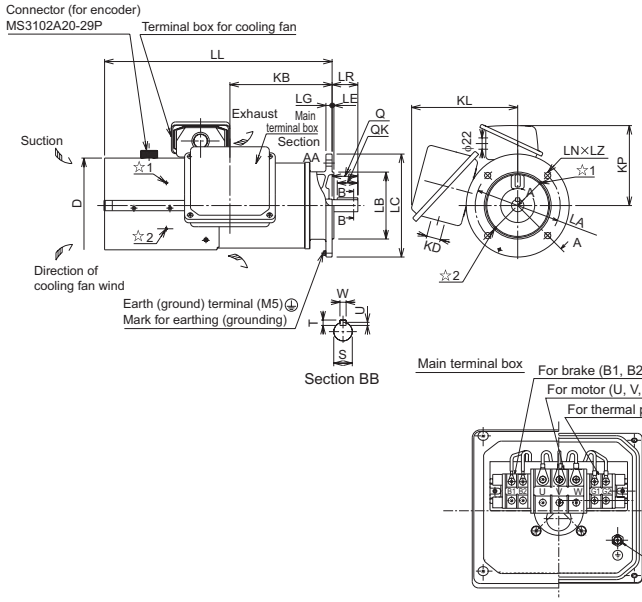
(Unit: mm)

SF-V5RU F□K	SF-V5RU F□K1	SF-V5RU F□K3	SF-V5RU F□K4	Flange Number	Frame No.	Mass (kg)	Motor													Shaft End							Terminal Screw Size		
							D	IE	KB	KD	KL	LA	LB	LC	LE	LG	LL	LN	LZ	LR	Q	QK	S	T	U	W	U,V,W	A,B,(C)	G1,G2
1	—	—	—	FF165	90L	26.5	183.6	—	198.5	27	220	165	130j6	200	3.5	12	402	4	12	50	50	40	24j6	7	4	8	M6	M4	M4
2	1	—	—	FF215	100L	37	207	130	213	27	231	215	180j6	250	4	16	432	4	14.5	60	60	45	28j6	7	4	8	M6	M4	M4
3	2	1	—	FF215	112M	46	228	141	239	27	242	215	180j6	250	4	16	448	4	14.5	60	60	45	28j6	7	4	8	M6	M4	M4
5	3	2	—	FF265	132S	65	266	156	256	27	256	265	230j6	300	4	20	484	4	14.5	80	80	63	38k6	8	5	10	M6	M4	M4
7	5	3	1	FF265	132M	70	266	156	294	27	256	265	230j6	300	4	20	522	4	14.5	80	80	63	38k6	8	5	10	M6	M4	M4
11	7	5	2	FF300	160M	110	318	207	318	56	330	300	250j6	350	5	20	625	4	18.5	110	110	90	42k6	8	5	12	M8	M4	M4
15	11	7	3	FF300	160L	125	318	207	362	56	330	300	250j6	350	5	20	669	4	18.5	110	110	90	42k6	8	5	12	M8	M4	M4
18	—	—	—	FF350	180M	160	363	230	378.5	56	352	350	300j6	400	5	20	690	4	18.5	110	110	90	48k6	9	5.5	14	M8	M4	M4
22	15	11	—			185																							
—	18	15	5	FF350	180L	225	363	230	416.5	56	352	350	300j6	400	5	20	728	4	18.5	110	110	90	55m6	10	6	16	M8	M4	M4
30	—	—	7	FF400	200L	270	406	255	485	90	346	400	350j6	450	5	22	823.5	8	18.5	140	140	110	60m6	11	7	18	M10	M4	M4
37, 45	22, 30	18, 22	—			290																							

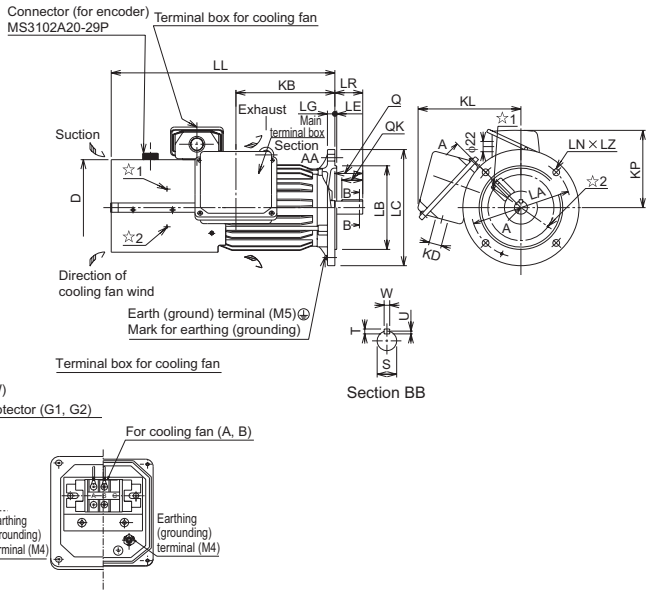
Note) 1. Install the motor on the floor and use it with the shaft horizontal.
For use under the shaft, the protection structure of the cooling fan is IP20.
2. Leave an enough clearance between the fan suction port and wall to ensure adequate cooling.
Also, check that the ventilation direction of a fan is from the opposite load side to the load side.
3 The size difference of top and bottom of the shaft center height is $^{0}_{-0.5}$
4 The 400V class motor has -H at the end of its type name.

Dedicated motor (SF-V5RU(H)) outline dimension drawings (flange type with brake)

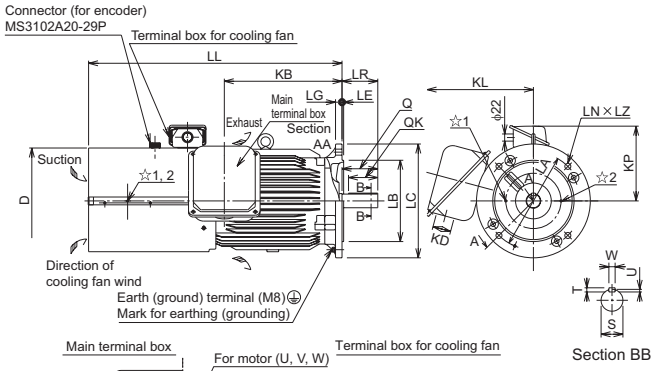
Frame Number 90L
SF-V5RUF(H) 1KB

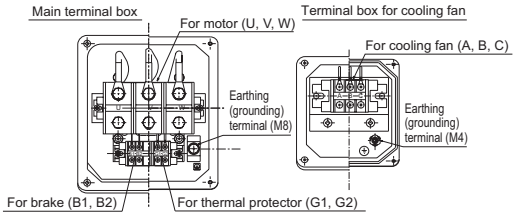


Frame Number 100L, 112M, 132S, 132M
SF-V5RUF(H) 2KB, 3KB, 5KB, 7KB



Frame Number 160M, 160L
SF-V5RUF(H) 11KB, 15KB





☆ indicates an inserting position of a bolt with hex head holes for manual opening.

Make sure to earth the earth terminal of the flange section as well as the earth terminal in the terminal box.

Dimensions table

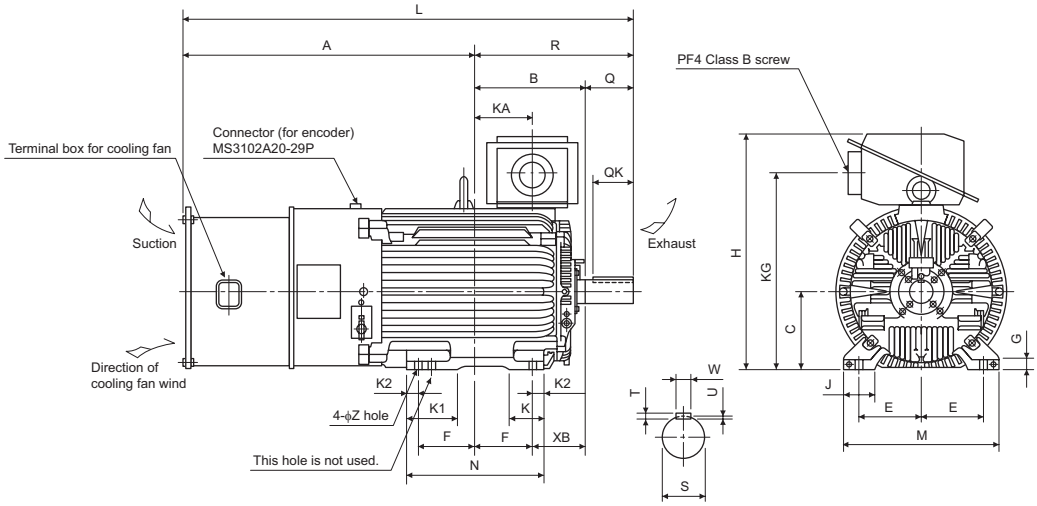
(Unit: mm)

SF-V5RU F□KB	SF-V5RU F□K1B	SF-V5RU F□K3B	SF-V5RU F□K4B	Flange Number	Frame No.	Mass (kg)	Motor													Shaft End							Terminal Screw Size			
							D	KB	KD	KL	KP	LA	LB	LC	LE	LG	LL	LN	LZ	LR	Q	QK	S	T	U	W	U,V,W	A,B,(C)	B1,B2	G1,G2
1	—	—	—	FF165	90L	31.5	183.6	198.5	27	220	155	165	130j6	200	3.5	12	442	4	12	50	50	40	24j6	7	4	8	M6	M4	M4	M4
2	1	—	—	FF215	100L	50	207	213	27	231	165	215	180j6	250	4	16	481.5	4	14.5	60	60	45	28j6	7	4	8	M6	M4	M4	M4
3	2	1	—	FF215	112M	58	228	239	27	242	178	215	180j6	250	4	16	525	4	14.5	60	60	45	28j6	7	4	8	M6	M4	M4	M4
5	3	2	—	FF265	132S	83	266	256	27	256	197	265	230j6	300	4	20	597	4	14.5	80	80	63	38k6	8	5	10	M6	M4	M4	M4
7	5	3	1	FF265	132M	88	266	294	27	256	197	265	230j6	300	4	20	635	4	14.5	80	80	63	38k6	8	5	10	M6	M4	M4	M4
11	7	5	2	FF300	160M	151	318	318	56	330	231	300	250j6	350	5	20	735.5	4	18.5	110	110	90	42k6	8	5	12	M8	M4	M4	M4
15	11	7	3	FF300	160L	167	318	362	56	330	231	300	250j6	350	5	20	779.5	4	18.5	110	110	90	42k6	8	5	12	M8	M4	M4	M4

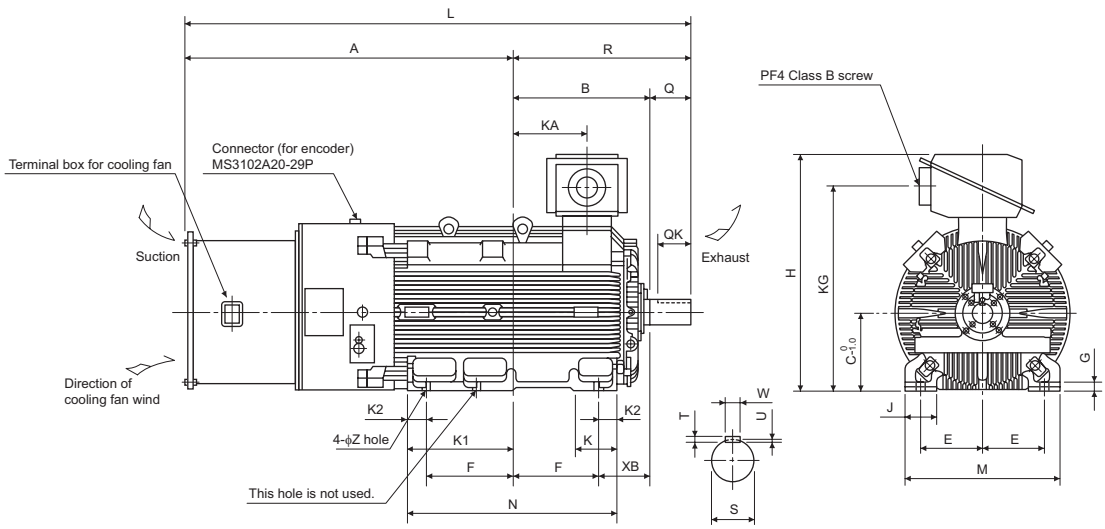
Note) 1. Install the motor on the floor and use it with the shaft horizontal.
2. Leave an enough clearance between the fan suction port and wall to ensure adequate cooling.
Also, check that the ventilation direction of a fan is from the opposite load side to the load side.
3 The size difference of top and bottom of the shaft center height is $^{0}_{-0.5}$
4 The 400V class motor has -H at the end of its type name.
5. Since a brake power device is a stand-alone, install it inside the enclosure.
(This device should be arranged at the customer side.)

Dedicated motor (SF-THY) outline dimension drawings (1500r/min series)

Frame Number 250MD, 280MD
75kW to 160kW



Frame Number 280L, 315H
200kW, 250kW



Dimensions table

(Unit: mm)

Output	Frame No.	Mass (kg)	Motor																				Shaft End Size					
			A	B	C	D	E	F	G	H	J	K	K1	K2	L	M	N	R	Z	XB	KA	KG	Q	QK	S	W	T	U
75	250MD	610	988.5	340.5	250	557	203	174.5	30	775	100	130	168	50	1471	486	449	482.5	24	168	157.5	635	140	110	ϕ75m6	20	12	7.5
90	250MD	660	988.5	340.5	250	557	203	174.5	30	775	100	130	168	50	1471	486	449	482.5	24	168	157.5	635	140	110	ϕ75m6	20	12	7.5
110	280MD	870	1049.5	397.5	280	607	228.5	209.5	30	845	110	130	181	40	1619	560	449	569.5	24	190	210.5	705	170	140	ϕ85m6	22	14	9
132	280MD	890	1049.5	397.5	280	607	228.5	209.5	30	845	110	130	181	40	1619	560	449	569.5	24	190	210.5	705	170	140	ϕ85m6	22	14	9
160	280MD	920	1049.5	397.5	280	607	228.5	209.5	30	845	110	130	181	40	1619	560	499	569.5	24	190	210.5	705	170	140	ϕ85m6	22	14	9
200	280L	1170	1210.5	416.5	280	652	228.5	228.5	30	885	110	160	160	75	1799	560	607	588.5	24	190	214.5	745	170	140	ϕ85m6	22	14	9
250	315H	1630	1343	565	315	717	254	355	35	965	130	175	428	80	2084	636	870	741	28	216	306	825	170	140	ϕ95m6	25	14	9

Note) The tolerance of the top and bottom of the center shaft height *C is $^{0}_{-0.5}$ for the 250 frame and $^{0}_{-1.0}$ for the 280 frame or more.

6.5 Installation of the heatsink portion outside the enclosure for use

When encasing the inverter in an enclosure, the generated heat amount in an enclosure can be greatly reduced by installing the heatsink portion of the inverter outside the enclosure. When installing the inverter in a compact enclosure, etc., this installation method is recommended.

6.5.1 When using a heatsink protrusion attachment (FR-A7CN)

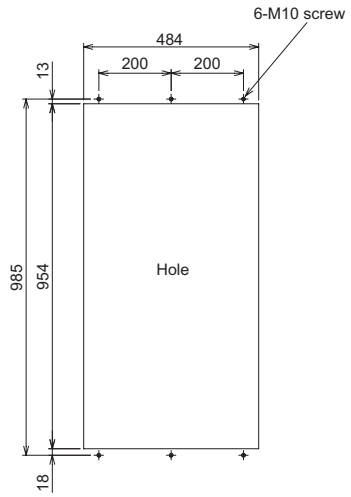
For the FR-A720-1.5K to 90K, FR-A740-0.4K to 132K, a heatsink can be protruded outside the enclosure using a heatsink protrusion attachment (FR-A7CN). (For the FR-A740-160K or higher, attachment is not necessary when the heatsink is to be protruded.)
For a panel cut dimension drawing and an installation procedure of the heatsink protrusion attachment (FR-A7CN) to the inverter, refer to a manual of "heatsink protrusion attachment".

6.5.2 Protrusion of heatsink of the FR-A740-160K or higher

(1) Panel cutting

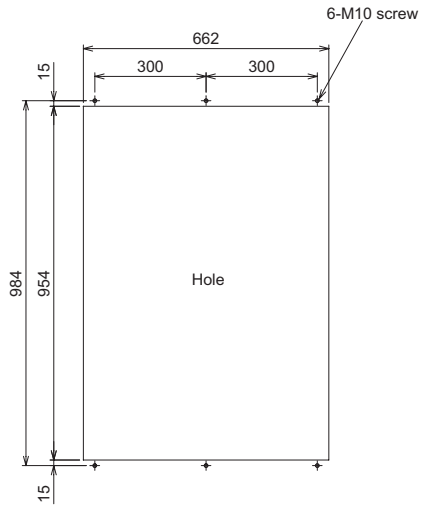
Cut the panel of the enclosure according to the inverter capacity.

• FR-A740-160K, 185K



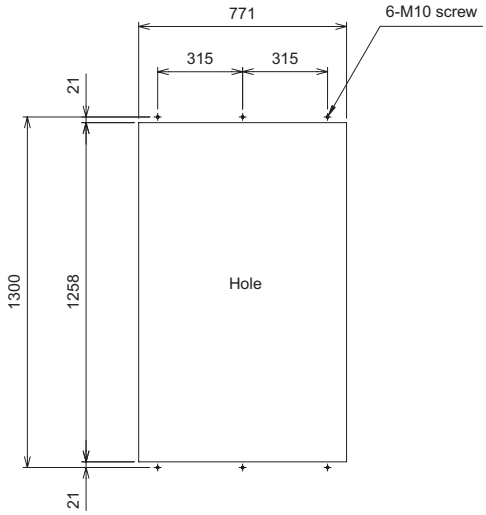
Unit: mm

• FR-A740-220K, 250K, 280K



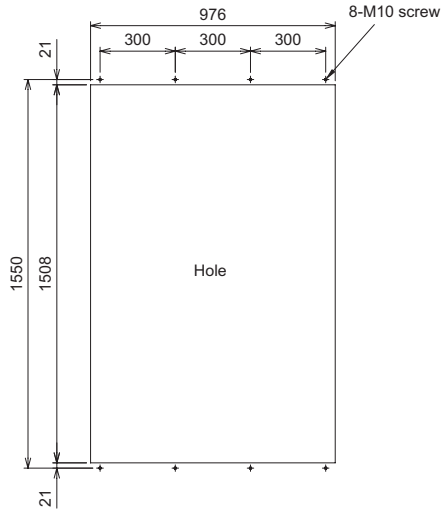
Unit: mm

• FR-A740-315K, 355K



Unit: mm

• FR-A740-400K, 450K, 500K

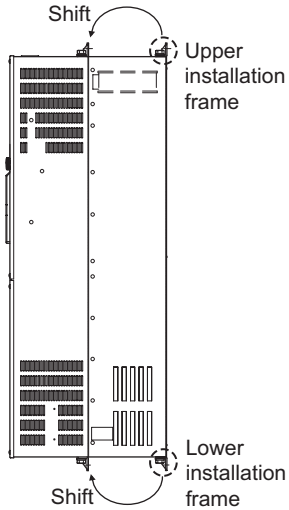


Unit: mm

(2) Shift and removal of a rear side installation frame

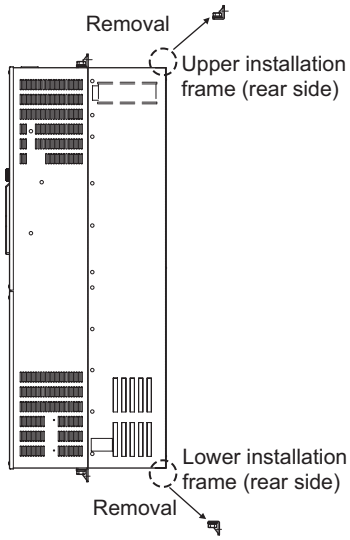
- **FR-A740-160K to 280K**

One installation frame is attached to each of the upper and lower parts of the inverter. Change the position of the rear side installation frame on the upper and lower sides of the inverter to the front side as shown on the right. When changing the installation frames, make sure that the installation orientation is correct.



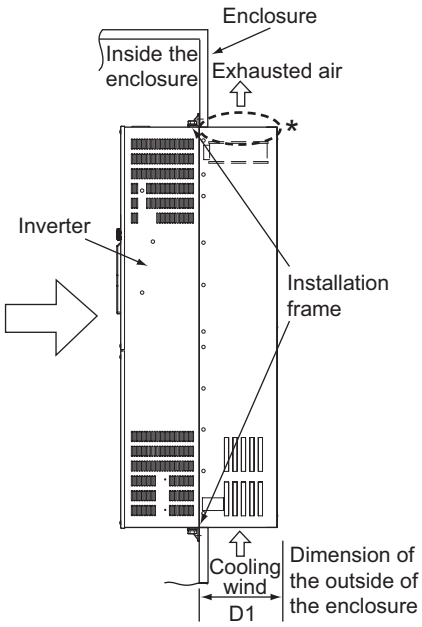
- **FR-A740-315K or higher**

Two installation frames each are attached to the upper and lower parts of the inverter. Remove the rear side installation frame on the upper and lower sides of the inverter as shown on the right.

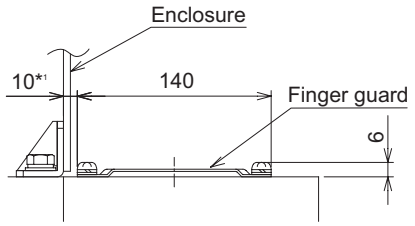


(3) Installation of the inverter

Push the inverter heatsink portion outside the enclosure and fix the enclosure and inverter with upper and lower installation frame.



* For the FR-A740-160K or higher, there are finger guards behind the enclosure. Therefore, the thickness of the panel should be less than 10mm (*1) and also do not place anything around finger guards to avoid contact with the finger guards.



Inverter Model	D1
FR-A740-160K, 185K	185
FR-A740-220K to 500K	184

Unit: mm

CAUTION

- Having a cooling fan, the cooling section which comes out of the enclosure can not be used in the environment of water drops, oil, mist, dust, etc.
- Be careful not to drop screws, dust etc. into the inverter and cooling fan section.

APPENDICES

Appendix 1 For customers who are replacing the older model with this inverter

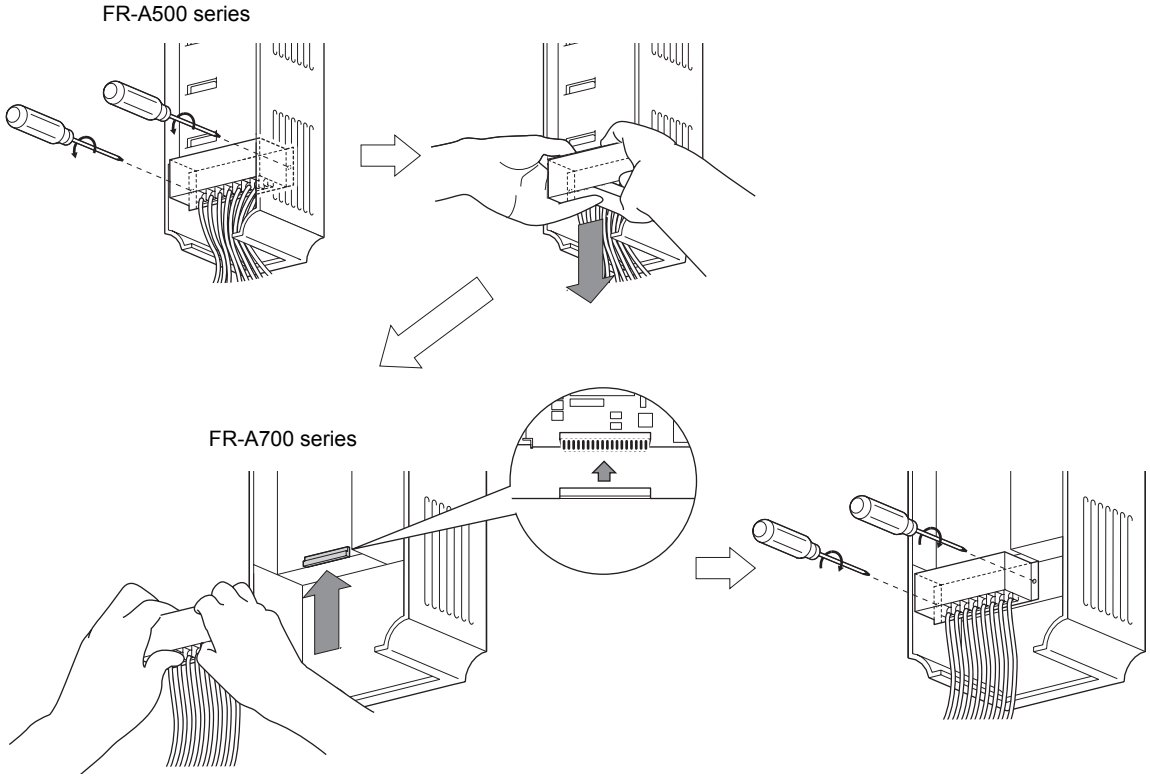
Appendix 1-1 Replacement of the FR-A500 series

(1) Instructions for installation

1) Removal procedure of the front cover was changed. (with screws) Please note. *(Refer to page 6.)*
2) Removal procedure of the operation panel was changed. (with screws) Please note. *(Refer to page 6.)*
3) Plug-in options of the A500 series are not compatible.
4) Operation panel (FR-DU04) cannot be used.
5) Setup software (FR-SW0-SETUP/FR-SW1-SETUP) cannot be used.

(2) Wiring instructions

1) The control circuit terminal block can be used for the FR-A700 series without removing wiring.
   Note that the wiring cover (0.4K to 22K) is not compatible.



(Note that the relay output 2 (A2, B2, C2) specific for the FR-A700 series can not be used with the FR-A500 series terminals.)

(3) Instructions for continuous use of the FR-PU04 (parameter unit)

1) For the FR-A700 series, many functions (parameters) have been added. When setting these parameters, the parameter name and setting range are not displayed. User initial value list and user clear of the HELP function can not be used.
2) For the FR-A700 series, many protective functions have been added. These functions activate, but all faults are displayed as "Fault 14". When the faults history has been checked, "E.14" appears. Added faults display will not appear on the parameter unit.
3) User initial value setting can not be used.
4) User registration/clear (user group 2) can not be used.
5) Parameter copy/verification function can not be used.

(4) Parameter resetting

It is easy if you use setup software (FR Configurator).

(5) Main differences and compatibilities with the FR-A500(L) series

Item		FR-A500(L)	FR-A700
Added functions	Control method	V/F control Advanced magnetic flux vector control	V/F control Advanced magnetic flux vector control Real sensorless vector control Vector control (used with a plug-in option FR-A7AP/FR-A7AL)
	PID control	PID action set point setting *(Pr. 133)*	Addition of "9999" to PID action set point (*Pr. 133*) setting (a value input from terminal 2 is a set point)
Changed functions	Intelligent mode selection	*Pr. 60*	Parameter number change *(Pr. 60 Energy saving control selection)* *(Pr. 292 Automatic acceleration/deceleration)*
	Motor poles	Number of motor poles *(Pr. 81 , Pr. 144)*	Setting the number of motor poles in Number of motor poles (*Pr. 81*) automatically changes the speed setting switchover (*Pr. 144*) setting.
	User group	User group 1 (16 parameters), User group 2 (16 parameters) (*Pr.160*, *Pr.173 to Pr.175*)	User group (16 parameters) only Setting methods were partially changed (*Pr.160*, *Pr.172 to Pr.173*)
	Communication option	Performing the parameter clear or all parameter clear (H5A96 or HAA99) from the DeviceNet communication option (FR-A5ND) clears the *Pr. 345* and *Pr. 346* settings.	Performing the parameter clear or all parameter clear (H5A96 or HAA99) from the DeviceNet communication option (FR-A7ND) does not clear the *Pr. 345* and *Pr. 346* settings.
Deleted functions	User initial value setting *(Pr. 199)*	Available	Not available Substitutable with the copy function of the operation panel (FR-DU07)
	Long wiring mode	*Pr. 240* setting 10, 11	Setting is not necessary (*Pr. 240* settings "10" and "11" were cleared)
	Program operation	*Pr. 200 to Pr. 231*	Function was cleared
Terminal block		Removable terminal block	Removable terminal block Upward compatibility (FR-A500 terminal block mountable)
PU		FR-PU04, DU04	FR-PU07 FR-DU07 FR-PU04 (Some functions, such as parameter copy, are unavailable.) FR-DU04 unavailable
Plug-in options		Dedicated plug-in option (incompatible)	
		Computer link, relay output option FR-A5NR	Built into the inverter (RS-485 terminals, relay output 2 points)
Installation size		· FR-A720-0.4K to 90K, FR-A740-0.4K to 7.5K, 18.5K to 55K, 110K, 160K are compatible in mounting dimensions For the FR-A740-11K, 15K, an optional intercompatibility attachment (FR-AAT) is necessary. · Heatsink protrusion attachment is not compatible. Also, the panel cut dimension of 3.7K or less, 200V class 30K, 55K or more, 400V class 11K, 15K, 75K or more is not compatible.	

Appendix 1-2 Replacement of the FR-A200 <EXCELENT> series

Instructions for installation

- When using the installation holes of the FR-A200(E) series, FR-A5AT (intercompatibility attachment) is necessary.

Appendix 2 SERIAL number check

Check the SERIAL number indicated on the inverter rating plate or package. *(Refer to page 1)*

Rating plate example

□	○	○	○○○○○○
Symbol	Year	Month	Control number

SERIAL (Serial No.)

The SERIAL consists of one symbol, two characters indicating production year and month, and six characters indicating control number.
The last digit of the production year is indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December.)

Appendix 3 Instructions for UL and cUL compliance

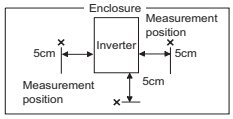
(Conforming standard UL 508C, CSA C22.2 No.14)

(1) General Precaution

The bus capacitor discharge time is 10 minutes. Before starting wiring or inspection, switch power off, wait for more than 10 minutes, and check for residual voltage between terminal P/+ and N/- with a meter etc., to avoid a hazard of electrical shock.

(2) Environment

Before installation, check that the environment meets following specifications.

Surrounding Air Temperature *1	Constant torque: -10°C to + 50°C (non-freezing) 
Ambient humidity	90%RH or less (non-condensing)
Storage temperature	-20°C to + 65°C
Ambience	Indoors (No corrosive and flammable gases, oil mist, dust and dirt.)
Altitude, vibration	Below 1000m, 5.9m/s^2 or less*2 at 10 to 55Hz (directions of X, Y, Z axes)

*1 Surrounding Air Temperature is a temperature measured at a measurement position in an enclosure. Ambient Temperature is a temperature outside an enclosure.

*2 2.9m/s^2 or less for the 160K or higher

(3) Installation

This inverter is UL-listed as a product for use in an enclosure.
Design an enclosure so that the inverter surrounding air temperature, humidity and atmosphere satisfy the specifications. *(Refer to page 175.)*

Wiring protection

For installation in the United States, Class RK5, Class J, Class CC, Class L, Class T or any faster acting fuses or UL 489 Molded Case Circuit Breaker (MCCB) must be provided, in accordance with the National Electrical Code and any applicable local codes.
For installation in Canada, Class RK5, Class J, Class CC, Class L, Class T or any faster acting fuses or UL 489 Molded Case Circuit Breaker (MCCB) must be provided, in accordance with the Canada Electrical Code and any applicable provincial codes.

FR-A720-□□K		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Rated fuse voltage(V)		240V or more														
Fuse maximum allowable rating (A)*	Without power factor improving reactor	15	20	30	40	60	80	150	175	200	225	300	350	400	500	500
	With power factor improving reactor	15	20	20	30	50	70	125	150	200	200	250	300	350	400	500
Molded case circuit breaker (MCCB) maximum allowable rating (A)*		15	15	20	25	40	60	80	110	150	175	225	250	350	400	500

FR-A720-□□K		75	90
Rated fuse voltage(V)		240V or more	
Fuse maximum allowable rating (A)*	Without power factor improving reactor	—	—
	With power factor improving reactor	600	700
Molded case circuit breaker (MCCB) maximum allowable rating (A)*		700	800

FR-A740-□□K		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Rated fuse voltage(V)		480V or more														
Fuse maximum allowable rating (A)*	Without power factor improving reactor	6	10	15	20	30	40	70	80	90	110	150	175	200	250	300
	With power factor improving reactor	6	10	10	15	25	35	60	70	90	100	125	150	175	200	250
Molded case circuit breaker (MCCB) maximum allowable rating (A)*		15	15	15	15	20	30	40	50	70	90	100	125	150	200	250

* Maximum allowable rating by US National Electrical Code.
Exact size must be chosen for each installation.

Class RK5 or Class T or Class L fuses or UL 489 Molded Case Circuit Breaker (MCCB) must be provided.

FR-A740-□□K		75	90	110	132	160	185	220	250	280	315	355	400	450	500
Rated fuse voltage(V)		500V or more													
Fuse maximum allowable rating (A)*	Without power factor improving reactor	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	With power factor improving reactor	300	350	400	500	600	700	800	900	1000	1100	1200	1350	1500	1800
Molded case circuit breaker (MCCB) maximum allowable rating (A)*		350	450	500	600	800	800	1000	1200	1200	1200	1600	1600	2000	2000

* Maximum allowable rating by US National Electrical Code.
Exact size must be chosen for each installation.

(4) Wiring of the power supply and motor

For wiring the input (R/L1, S/L2, T/L3) and output (U, V, W) terminals of the inverter, use the UL Listed copper, stranded wires (rated at 75°C) and round crimping terminals. Crimp the crimping terminals with the crimping tool recommended by the terminal maker.

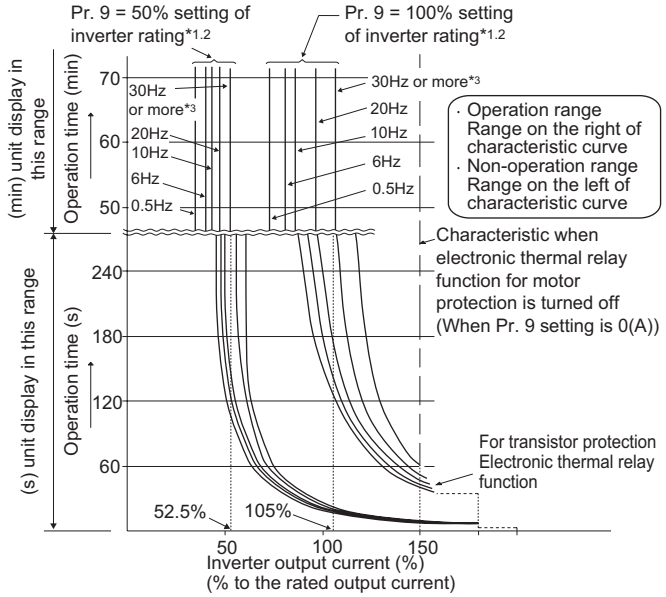
(5) Short circuit ratings

- 200V class
  Suitable For Use in A Circuit Capable Of Delivering Not More Than 100kA rms Symmetrical Amperes, 264V Maximum.
- 400V class
  55K or lower
  Suitable For Use in A Circuit Capable Of Delivering Not More Than 100kA rms Symmetrical Amperes, 528V Maximum.
  75K or higher
  Suitable For Use in A Circuit Capable Of Delivering Not More Than 100kA rms Symmetrical Amperes, 550V Maximum.

(6) Motor overload protection

This inverter is certified as a motor overload protection device by UL.
When using the electronic thermal relay function as motor overload protection, set the rated motor current to *Pr. 9 Electronic thermal O/L relay*.

Electronic thermal relay function operation characteristic



This function detects the overload (overheat) of the motor, stops the operation of the inverter's output transistor, and stops the output.
(The operation characteristic is shown on the left)

When using the Mitsubishi constant-torque motor

1) Set "1" or any of "13" to "18", "50", "53", "54" in *Pr. 71*.
(This provides a 100% continuous torque characteristic in the low-speed range.)
2) Set the rated current of the motor in *Pr. 9*.

*1 When 50% of the inverter rated output current (current value) is set in *Pr. 9*

*2 The % value denotes the percentage to the inverter rated output current. It is not the percentage to the motor rated current.

*3 When you set the electronic thermal relay function dedicated to the Mitsubishi constant-torque motor, this characteristic curve applies to operation at 6Hz or higher.

CAUTION

- Protective function by electronic thermal relay function is reset by inverter power reset and reset signal input. Avoid unnecessary reset and power-off.
- When multiple motors are operated by a single inverter, protection cannot be provided by the electronic thermal relay function. Install an external thermal relay to each motor.
- When the difference between the inverter and motor capacities is large and the setting is small, the protective characteristics of the electronic thermal relay function will be deteriorated. In this case, use an external thermal relay.
- A special motor cannot be protected by the electronic thermal relay function. Use the external thermal relay.
- Electronic thermal relay may not function when 5% or less of inverter rated current is set to electronic thermal relay setting.

Appendix 4 Instructions for compliance with the EU Directives

The EU Directives are issued to standardize different national regulations of the EU Member States and to facilitate free movement of the equipment, whose safety is ensured, in the EU territory.
Since 1996, compliance with the EMC Directive that is one of the EU Directives has been legally required. Since 1997, compliance with the Low Voltage Directive, another EU Directive, has been also legally required. When a manufacturer confirms its equipment to be compliant with the EMC Directive and the Low Voltage Directive, the manufacturer must declare the conformity and affix the CE marking.

- **The authorized representative in the EU**

  The authorized representative in the EU is shown below.
  Name: Mitsubishi Electric Europe B.V.
  Address: Gothaer Strasse 8, 40880 Ratingen, Germany

- Note

  We declare that this inverter conforms with the EMC Directive in industrial environments and affix the CE marking on the inverter. When using the inverter in a residential area, take appropriate measures and ensure the conformity of the inverter used in the residential area.

(1) EMC Directive

We declare that this inverter conforms with the EMC Directive and affix the CE marking on the inverter.

- EMC Directive: 2004/108/EC
- Standard(s): EN61800-3:2004 (Second environment / PDS Category "C3")

Note: First environment

Environment including residential buildings. Includes buildings directly connected without a transformer to the low voltage power supply network which supplies power to residential buildings.

Second environment

Environment including all buildings except buildings directly connected without a transformer to the low voltage power supply network which supplies power to residential buildings.

- Note

  Set the EMC filter valid and install the inverter and perform wiring according to the following instructions.

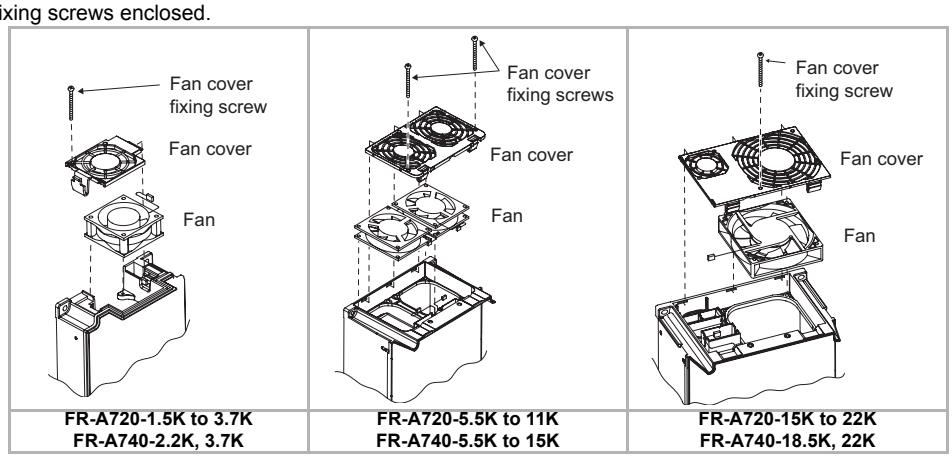
  * The inverter is equipped with a built-in EMC filter. Set the EMC filter valid. (The EMC filter is invalid when shipped from the factory. (The FR-A720-0.4K and 0.75K are always valid.) For details, *refer to page 10.*)
  * Connect the inverter to an earthed power supply.
  * Install a motor and a control cable written in the EMC Installation Manual (BCN-A21041-204) according to the instruction.
  * The cable length between the inverter and the motor is 5 m maximum.
  * Confirm that the inverter conforms with the EMC Directive as the industrial drives application for final installation.

(2) Low Voltage Directive

We have self-confirmed our inverters as products compliant to the Low Voltage Directive (Conforming standard EN 50178) and affix the CE marking on the inverters.

Outline of instructions

* Do not use an earth leakage current breaker as an electric shock protector without connecting the equipment to the earth. Connect the equipment to the earth securely.
* Wire the earth terminal independently. (Do not connect two or more cables to one terminal.)
* Use the cable sizes on *page 14* under the following conditions.
  · Surrounding air temperature: 40°C maximum
  If conditions are different from above, select appropriate wire according to EN60204 Appendix C TABLE 5.
* Use a tinned (plating should not include zinc) crimping terminal to connect the earth (ground) cable. When tightening the screw, be careful not to damage the threads.
  For use as a product compliant with the Low Voltage Directive, use PVC cable whose size is indicated on *page 14*.
* Use the moulded case circuit breaker and magnetic contactor which conform to the EN or IEC Standard.
* When using an earth leakage current breaker, use a residual current operated protective device (RCD) of type B (breaker which can detect both AC and DC). If not, provide double or reinforced insulation between the inverter and other equipment, or put a transformer between the main power supply and inverter.
* Use the inverter under the conditions of overvoltage category II (usable regardless of the earth (ground) condition of the power supply), overvoltage category III (usable with the earthed-neutral system power supply, 400V class only) and pollution degree 2 or lower specified in IEC664.
  · To use the inverter of 30K or higher (IP00) under the conditions of pollution degree 2, install it in the enclosure of IP 2X or higher.
  · To use the inverter under the conditions of pollution degree 3, install it in the enclosure of IP54 or higher.
  · To use the inverter of 22K or lower (IP20) outside of an enclosure in the environment of pollution degree 2, fix a fan cover with fan cover fixing screws enclosed.



FR-A720-1.5K to 3.7K FR-A740-2.2K, 3.7K	FR-A720-5.5K to 11K FR-A740-5.5K to 15K	FR-A720-15K to 22K FR-A740-18.5K, 22K

* On the input and output of the inverter, use cables of the type and size set forth in EN60204 Appendix C.
* The operating capacity of the relay outputs (terminal symbols A1, B1, C1, A2, B2, C2) should be 30VDC, 0.3A. (Relay outputs have basic isolation from the inverter internal circuit.)
* Control circuit terminals on *page 9* are safely isolated from the main circuit.
* Environment

	During Operation	In Storage	During Transportation
Surrounding air temperature	-10°C to +50°C	-20°C to +65°C	-20°C to +65°C
Ambient humidity	90% RH or less	90% RH or less	90% RH or less
Maximum altitude	1000m	1000m	10000m

Details are given in the technical information "Low Voltage Directive Conformance Guide" (BCN-A21041-203). Please contact your sales representative.

Appendix 5 Compliance with the Radio Waves Act (South Korea)

This product complies with the Radio Waves Act (South Korea).
Note the following when using the product in South Korea.
이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을
주의하시기 바라며,가정외의 지역에서 사용하는 것을 목적으로 합니다.
(The product is for business use (Class A) and meets the electromagnetic compatibility requirements. The seller and the user must note the above point, and use the product in a place except for home.)

REVISIONS

*The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Jun. 2005	IB(NA)-0600225ENG-A	First edition
Aug. 2005	IB(NA)-0600225ENG-B	Addition · FR-A720-75K, 90K · FR-A740-0.4K to 160K
Sep. 2005	IB(NA)-0600225ENG-C	Addition FR-A740-185K to 500K Compatible with the FR-A7AP · Orientation control · Encoder feedback control · Vector control
Feb. 2007	IB(NA)-0600225ENG-D	Addition · Pr. 539 Modbus-RTU communication check time interval · Setting value "4" for Pr. 17 MRS input selection · Setting values "10, 11" for Pr. 495 Remote output selection Modification · Change in specification of a voltage/current input switch and addition of a switch to the 3.7K or lower.
Mar. 2010	IB(NA)-0600225ENG-E	Addition · Pr. 296 Password lock level · Pr. 297 Password lock/unlock · Setting value "1" for Pr. 419 Position command source selection · Setting value "2" for Pr. 804 Torque command source selection · Failsafe Modification · 4.6 Check first when you have a trouble · Instructions for compliance with the EU Directives
Jun. 2011	IB(NA)-0600225ENG-F	Addition · 3.2.7 Energy saving operation for fans and pumps (Pr. 14, Pr. 60) · Setting value "2" for Pr. 850 Brake operation selection · Setting values "11, 13" for Pr. 270 Stop-on contact/load torque high-speed frequency control selection · Motor temperature detection signal (Y55) · Motor temperature monitor · Compliance with the Radio Waves Act (South Korea)

⚠ For Maximum Safety

- Mitsubishi inverters are not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.
- When considering this product for operation in special applications such as machinery or systems used in passenger transportation, medical, aerospace, atomic power, electric power, or submarine repeating applications, please contact your nearest Mitsubishi sales representative.
- Although this product was manufactured under conditions of strict quality control, you are strongly advised to install safety devices to prevent serious accidents when it is used in facilities where breakdowns of the product are likely to cause a serious accident.
- Please do not use this product for loads other than three-phase induction motors.

FR-A700 Series
Instruction Manual Supplement

For the FR-A740 and FR-A720, the following specifications are added.

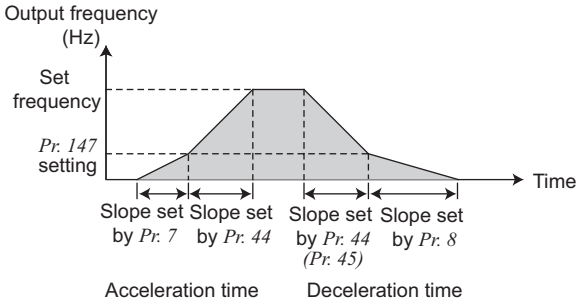
(1) Acceleration/deceleration time switching frequency (*Pr. 147*)

When output frequency reaches *Pr. 147 Acceleration/deceleration time switching frequency* or higher, the acceleration/deceleration time automatically switches to *Pr. 44 Second acceleration/deceleration time* and *Pr. 45 Second deceleration time* settings. The RT signal is not necessary for switching the acceleration/deceleration time.

Pr. Number	Name	Initial Value	Setting Range	Description
147	Acceleration/ deceleration time switching frequency	9999	0 to 400Hz	Frequency when automatically switching to the acceleration/ deceleration time of *Pr. 44* and *Pr. 45*.
			9999	No function

- When the RT signal (X9 signal) turns ON, the acceleration/deceleration time switches to the second (third) acceleration/deceleration time even when the output frequency has not reached the *Pr. 147* setting. Priority of switching is X9 signal > RT signal > *Pr. 147* setting.
- If the *Pr. 147* setting is lower than *Pr. 10 DC injection brake operation frequency* or *Pr. 13 Starting frequency* setting, the acceleration/deceleration time switches to the *Pr. 44 (Pr. 45)* setting when the output frequency exceeds the *Pr. 10* or *Pr. 13* setting.

Pr. 147 Setting	Acceleration/ Deceleration Time	Description
9999 (initial value)	*Pr. 7, Pr. 8*	No automatic switching of the acceleration/ deceleration time
0.00Hz	*Pr. 44, Pr. 45*	Second acceleration/ deceleration time from a start
0.01Hz ≤ *Pr. 147* ≤ Set frequency	Output frequency < *Pr. 147* : *Pr. 7, Pr. 8* *Pr. 147* ≤ Output frequency : *Pr. 44, Pr. 45*	Acceleration/deceleration time automatic switching
Set frequency < *Pr. 147*	*Pr. 7, Pr. 8*	No automatic switching, since output frequency will not reach the switching frequency



• Switching frequency for each control method

Control Method	Switching frequency
V/F control	Output frequency
Advanced magnetic flux vector control	Output frequency before the slip compensation
Real sensorless vector control	Estimated speed converted as frequency
Vector control, encoder feedback control	Actual motor speed converted as frequency

(2) USB automatic recognition (*Pr. 551 PU mode operation command source selection* = "9999")

FR-A700 can automatically recognize the USB connection and switch the command source during PU operation mode.

Pr. Number	Name	Initial Value	Setting Range	Description
551 *	**PU mode operation command source selection**	9999	1	RS-485 terminals are the command source when PU operation mode.
			2	PU connector is the command source when PU operation mode.
			3	USB connector is the command source when PU operation mode.
			9999	USB automatic recognition Normally, the PU connector is the command source. When USB is connected, the USB connector is the command source.

* This parameter allows its setting to be changed in any operation mode even if "0 (initial value)" is set in *Pr. 77 Parameter write selection*.
When a communication option is installed, parameter setting is always enabled.

(3) X83 signal (0V voltage calibration request) and Y83 signal (during 0V voltage calibration)

FR-A700 is compatible with the FR-A7AD plug-in option. The following parameter setting values are added for 0V voltage calibration of high speed analog output. (For details, refer to *the Instruction Manual of FR-A7AD.*)

	Parameter	Setting Value
Input signal	*Pr. 178 to Pr. 189 Input terminal function selection*	83: 0V voltage calibration request (X83)
Output signal	*Pr. 190 to Pr. 196 Output terminal function selection*	83, 183: During 0V voltage calibration (Y83)
	Pr. 313 to Pr. 319 DO0 to DO6 output terminal function selection (For details, refer to *the Instruction Manual of FR-A7AY.*)	
	Pr. 320 to Pr. 322 RA1 to RA3 output terminal function selection (For details, refer to *the Instruction Manual of FR-A7AR.*)	83: During 0V voltage calibration (Y83)

MEMO

FR-A700 Series
Instruction Manual Supplement

The FR-A700 series that has the SERIAL on *page 24* or later are compatible with the following specifications. Check the serial number printed on the rating plate of the inverter.

In the following sections, PM indicates the functions that are driven by PM sensorless vector control.

1 PM sensorless vector control PM

Purpose	Parameters to be Set		Refer to Page
To perform IPM parameter initialization	IPM parameter initialization	Pr. 998	*4*
To select the torque characteristic in a low-speed range.	Low-speed range torque characteristics	Pr. 788	*14*
To adjust the gain for PM sensorless vector control	Adjusting the speed control gain	Pr. 820, Pr. 821	*Chapter 4 of the Instruction Manual (Applied)*

Highly efficient motor control and highly accurate motor speed control can be performed by using the inverter with an IPM (internal permanent magnet) motor, which is more efficient than an induction motor.
The motor speed is calculated based on the output voltage and current from the inverter. It does not require a speed detector such as an encoder. The inverter drives the IPM motor with the least required current when a load is applied in order to achieve the highest motor efficiency.

POINT

The following conditions must be met to perform PM sensorless vector control.
- For the motor model, IPM motor must be used.
- The motor capacity must be equal to or one rank lower than the inverter capacity.
- Single-motor operation (one motor run by one inverter) must be performed.
- The overall wiring length with the motor must be 100m or less. (When the wiring length exceeds 30m, offline auto tuning must be performed.)

CAUTION

- The speed setting range for an MM-CF IPM motor is between 0 and 200Hz.
- The carrier frequency is limited during PM sensorless vector control. (Refer to *page 16*)
- Constant-speed operation cannot be performed in the low-speed range of 200r/min or less under current synchronization operation. (Refer to *page 14*)
- During PM sensorless vector control, the RUN signal is output about 100ms after turning ON the start command (STF, STR). The delay is due to the magnetic pole detection.
- During PM sensorless vector control, the automatic restart after instantaneous power failure function operates only when an MM-CF IPM motor is connected. When a built-in brake or a regeneration unit is used, the frequency search may not be available at 2200r/min or higher. The restart operation cannot be performed until the motor speed drops to a frequency where the frequency search is available.

BCN-C22005-634

1.1 Setting procedure of PM sensorless vector control PM

· This inverter is set for a general-purpose motor in the initial setting. Follow the following procedure to change the setting for the PM sensorless vector control.

Driving an MM-CF IPM motor

Perform IPM parameter initialization by selecting IPM in the parameter setting mode on the operation panel.* (Refer to *page 3*)

Set "3003" (MM-CF IPM motor parameter setting (rotations per minute)) in "IPM" (IPM parameter initialization) to select the PM sensorless vector control.
P.RUN on the operation panel (FR-DU07) is lit when PM sensorless vector control is set.

Driving an IPM motor other than MM-CF

Make the motor setting. *(Pr. 71, Pr. 80, Pr. 81, etc.)* (Refer to *page 7*)

Set "8093" (IPM motor other than MM-CF) in *Pr. 71 Applied motor*, the motor capacity (kW) in *Pr. 80 Motor capacity*, and the number of poles in *Pr. 81 Number of motor poles*. Refer to *page 7* for other parameters.
(Setting "9999 (initial value)" in *Pr. 80* or *Pr. 81* selects V/F control.)

Perform offline auto tuning for an IPM motor. *(Pr.96)* (Refer to *page 7*)

To perform tuning, set "1" (offline auto tuning without rotating motor (for other than MM-CF)) in *Pr. 96*.

Use *Pr.998* to perform IPM parameter initialization. (Refer to *page 4*)

Setting "8009" or "8109" in *Pr. 998 IPM parameter initialization* selects the IPM motor parameter settings.
"8009": Parameter (rotations per minute) settings for an IPM motor other than MM-CF
"8109": Parameter (frequency) settings for an IPM motor other than MM-CF

Set parameters such as the acceleration/deceleration time and multi-speed setting.

Set parameters such as the acceleration/deceleration time and multi-speed setting as required.

Set the operation command. (Refer to *the Instruction Manual.*)

Select the start command and speed command.

Test run

As required for MM-CF.

· Perform offline auto tuning for an IPM motor. (Refer to *page 7*)

* Two IPM parameter initialization methods are available for MM-CF IPM motors; setting *Pr.998 IPM parameter initialization*, and selecting "IPM" (IPM parameter initialization) mode on the operation panel. One of the two methods can be selected.
To change to the PM sensorless vector control, perform IPM parameter initialization at first. If parameter initialization is performed after setting other parameters, some of those parameters will be initialized too. (Refer to *page 6* for the parameters that are initialized.)

REMARKS

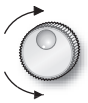
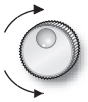
· "Er1" appears if IPM parameter initialization is performed while *Pr.72* = "25."
· To use a motor capacity that is one rank lower than the inverter capacity, set *Pr. 80 Motor capacity* before performing IPM parameter initialization.
· To perform PM sensorless vector control on an IPM motor other than MM-CF, contact your sales representative.

(1) PM sensorless vector control setting by selecting IPM in the parameter setting mode on the operation panel (1 PN)

POINT

· The parameters required to drive an MM-CF IPM motor are automatically changed as a batch. (Refer to *page 6*)

Operation example: Initialize the parameter setting for an MM-CF IPM motor by selecting IPM in the parameter setting mode on the operation panel.

Operation	Display
1. Screen at power-ON The monitor display appears.	
2. Parameter setting mode Press (MODE) to choose the parameter setting mode.	(MODE) ⇨  The parameter number read previously appears.
3. Selecting the parameter Turn dial until 1 PN (IPM parameter initialization) appears.	 ⇨ 
4. Displaying the setting Press (SET) to read the currently set value. "0" (initial value) appears.	(SET) ⇨ 
5. Selecting the setting Turn dial to change it to the set value "3003".	 ⇨ 
6. Parameter setting Press (SET) to set.	(SET) ⇨  Flicker ... Parameter setting complete!! P.RUN indicator is lit. 

· Turn dial to read another parameter.

· Press (SET) to show the setting again.

· Press (SET) twice to show the automatic parameter setting (AUTO).

Setting	Description
0	Parameter settings for a general-purpose motor
3003	Parameter settings for an IPM motor MM-CF (rotations per minute)

REMARKS

· Performing IPM parameter initialization by selecting IPM in the parameter setting mode on the operation panel automatically changes the *Pr. 998 IPM parameter initialization* setting.

· In the initial parameter setting, the capacity same as the inverter capacity is set in *Pr. 80 Motor capacity*. (Refer to *page 16*.) To use a motor capacity that is one rank lower than the inverter capacity, set *Pr. 80 Motor capacity* before performing IPM parameter initialization by selecting the mode on the operation panel.

· To set a speed or to display monitored items in frequency, set *Pr. 998*. (Refer to *page 4*.)

(2) PM sensorless vector control display and PM sensorless vector control signal

P.RUN on the operation panel (FR-DU07) is lit and the PM sensorless vector control signal (IPM) is output during PM sensorless vector control.
For the terminal to output the PM sensorless vector control signal, assign the function by setting "57 (positive logic)" or "157 (negative logic)" in any of *Pr.190 to Pr.196 (Output terminal function selection)*.

(3) Loss of synchronism detection

Operation Panel Indication	E.SOT PM	E.SOT	FR-PU04	Fault 14
			FR-PU07	Motor step out
Name	Loss of synchronism detection			
Description	Stops the output when the operation is not synchronized. (This function is only available under PM sensorless vector control.)			
Description	· Check that the IPM motor is not driven overloaded. · Check if a start command is given to the inverter while the IPM motor is coasting. · Check if a motor other than the IPM motor (MM-CF series) is driven.			
Corrective action	· Set the acceleration time longer. · Reduce the load. · If the inverter restarts during coasting, set *Pr.57 Restart coasting time* ≠ "9999," and select the automatic restart after instantaneous power failure. · Drive an IPM motor (MM-CF series). · To perform PM sensorless vector control on an IPM motor other than MM-CF, contact your sales representative.			

1.2 Initializing the parameters required for the PM sensorless vector control (Pr.998) PM

- By performing IPM parameter initialization, PM sensorless vector control is selected and the parameters, which are required to drive an IPM motor, are selected. Initial settings and setting ranges of the parameters are adjusted automatically to drive an IPM motor.
- Two IPM parameter initialization methods are available; setting *Pr.998 IPM parameter initialization*, and selecting I PN (IPM parameter initialization) mode on the operation panel. One of the two methods can be selected.

Parameter number	Name	Initial value	Setting range	Description	
998 *1	IPM parameter initialization	0	0	Parameter settings for a general-purpose motor (frequency)	Initial parameter settings required to drive a general-purpose motor are set.
			3003	Parameter settings for an MM-CF IPM motor (rotations per minute)	Initial parameter settings required to drive an IPM motor are set.
			3103	Parameter settings for an MM-CF IPM motor (frequency)	
			8009	Parameter (rotations per minute) settings for an IPM motor other than MM-CF (after tuning) *2	
			8109	Parameter (frequency) settings for an IPM motor other than MM-CF (after tuning) *2	

*1 This parameter allows its setting to be changed in any operation mode even if "0 (initial value)" is set in *Pr. 77 Parameter write selection*.

*2 To use an IPM motor other than MM-CF, offline auto tuning must be performed for the IPM motor.

(1) *IPM parameter initialization (Pr.998)*

- To use a motor capacity that is one rank lower than the inverter capacity, set *Pr.80 Motor capacity* before performing IPM parameter initialization. By performing IPM parameter initialization, initial settings required to drive an IPM motor are set in parameters.
- When *Pr. 998* = "3003," the monitor is displayed and the frequency is set using the motor rotations per minute. To use frequency to display or set, set *Pr. 998* = "3103."
- Set *Pr. 998* = "0" to change the PM sensorless vector control parameter settings to the parameter settings required to drive a general-purpose motor.
- When using an IPM motor other than MM-CF, set *Pr. 998* = "8009 or 8109" to select the parameter settings required to perform PM sensorless vector control. The setting can be made after performing offline auto tuning for an IPM motor.

***Pr.998* Setting**	**Description**	**Operation IPM in the parameter setting mode**
0 (initial value)	Parameter settings for a general-purpose motor (frequency)	IPM (IPM)⇒ Write "0"
3003	Parameter settings for an IPM motor MM-CF (rotations per minute)	IPM (IPM)⇒ Write "3003"
3103	Parameter settings for an IPM motor MM-CF (frequency)	—
8009	Parameter (rotations per minute) settings for an IPM motor other than MM-CF (after tuning)	—
8109	Parameter (frequency) settings for an IPM motor other than MM-CF (after tuning)	—

REMARKS

- Make sure to set *Pr. 998* before setting other parameters. If the *Pr. 998* setting is changed after setting other parameters, some of those parameters will be initialized too. (Refer to "(2) " for the parameters that are initialized.)
- To change back to the parameter settings required to drive a general-purpose motor, perform parameter clear or all parameter clear.
- If the setting of *Pr. 998 IPM parameter initialization* is changed from "3003, 8009 (rotations per minute)" to "3103, 8109 (frequency)," or from "3103, 8109" to "3003, 8009," all the target parameters are initialized.
  The purpose of *Pr. 998* is not to change the display units. Use *Pr. 144 Speed setting switchover* to change the display units between rotations per minute and frequency. *Pr. 144* enables switching of display units between rotations per minute and frequency without initializing the parameter settings.
  Example) Changing the *Pr. 144* setting between "6" and "106" switches the display units between frequency and rotations per minute.
- To perform PM sensorless vector control on an IPM motor other than MM-CF, contact your sales representative.

(2) IPM parameter initialization list

The parameter settings in the following table are changed to the settings required to perform PM sensorless vector control by selecting PM sensorless vector control with the IPM parameter initialization mode on the operation panel or with *Pr. 998 IPM parameter initialization* setting. The changed settings differ according to the IPM motor specification (capacity).

Performing parameter clear or all parameter clear sets back the parameter settings to the settings required to drive a general-purpose motor.

Parameter	Name	Setting					Setting increments	
		General-purpose motor	IPM motor (rotations per minute)		IPM motor (frequency)			
	Pr.998	0 (Initial setting)	3003 (MM-CF)	8009 (other than MM-CF)	3103 (MM-CF)	8109 (other than MM-CF)	3003, 8009	0, 3103, 8109
1	Maximum frequency	120/60Hz *1	3000r/min	—	200Hz	—	1r/min	0.01Hz
4	Multi-speed setting (high speed)	60Hz	2000r/min	*Pr. 84*	133.33Hz	*Pr. 84*	1r/min	0.01Hz
9	Electronic thermal O/L relay	Rated inverter current	Rated motor current (Refer to *page 16*)	—	Rated motor current (Refer to *page 16*)	—	0.01A/0.1A *1	
13	Starting frequency	0.5Hz	8r/min *5	*Pr. 84* × 10%	0.5Hz *6	*Pr. 84* × 10%	1r/min	0.01Hz
15	Jog frequency	5Hz	200r/min	*Pr. 84* × 10%	13.33Hz	*Pr. 84* × 10%	1r/min	0.01Hz
18	High speed maximum frequency	120/60Hz *1	3000r/min	—	200Hz	—	1r/min	0.01Hz
20	Acceleration/deceleration reference frequency	60Hz	2000r/min	*Pr. 84*	133.33Hz	*Pr. 84*	1r/min	0.01Hz
22	Stall prevention operation level	150%	150%				0.1%	
37	Speed display	0	0				1	
55	Frequency monitoring reference	60Hz	2000r/min	*Pr. 84*	133.33Hz	*Pr. 84*	1r/min	0.01Hz
56	Current monitoring reference	Rated inverter current	Rated motor current (Refer to *page 16*)	*Pr. 859*	Rated motor current (Refer to *page 16*)	*Pr. 859*	0.01A/0.1A *1	
71	Applied motor	0	330 *2	—	330 *2	—	1	
80	Motor capacity	9999	Motor capacity (MM-CF) *3	—	Motor capacity (MM-CF) *3	—	0.01kW/0.1kW *1	
81	Number of motor poles	9999	8	—	8	—	1	
84	Rated motor frequency	60Hz	2000r/min	—	133.33Hz	—	1r/min	0.01Hz
125 (903)	Terminal 2 frequency setting gain frequency	60Hz	2000r/min	*Pr. 84*	133.33Hz	*Pr. 84*	1r/min	0.01Hz
126 (905)	Terminal 4 frequency setting gain frequency	60Hz	2000r/min	*Pr. 84*	133.33Hz	*Pr. 84*	1r/min	0.01Hz
144	Speed setting switchover	4	108	*Pr. 81* +100	8	*Pr. 81*	1	
240	Soft-PWM operation selection	1	0				1	
263	Subtraction starting frequency	60Hz	2000r/min	*Pr. 84*	133.33Hz	*Pr. 84*	1r/min	0.01Hz
266	Power failure deceleration time switchover frequency	60Hz	2000r/min	*Pr. 84*	133.33Hz	*Pr. 84*	1r/min	0.01Hz
374	Overspeed detection level	140Hz	3150r/min	*Pr. 1 (Pr. 18)* × 105%	210Hz	*Pr. 1 (Pr. 18)* × 105%	1r/min	0.01Hz
386	Frequency for maximum input pulse	60Hz	2000r/min	*Pr. 84*	133.33Hz	*Pr. 84*	1r/min	0.01Hz
390 *4	% setting reference frequency	60Hz	133.33Hz	*Pr. 84*	133.33Hz	*Pr. 84*	0.01Hz	
505	Speed setting reference	60Hz	133.33Hz	*Pr. 84*	133.33Hz	*Pr. 84*	0.01Hz	
557	Current average value monitor signal output reference current	Rated inverter current	Rated motor current (Refer to *page 16*)	*Pr. 859*	Rated motor current (Refer to *page 16*)	*Pr. 859*	0.01A/0.1A *1	
820	Speed control P gain 1	60%	30%				1%	
821	Speed control integral time 1	0.333s	0.333s				0.001s	
824	Torque control P gain 1	100%	100%				1%	
825	Torque control integral time 1	5ms	20ms				0.1ms	
870	Speed detection hysteresis	0Hz	8r/min		0.5Hz		1r/min	0.01Hz
885	Regeneration avoidance compensation frequency limit value	6Hz	200r/min	*Pr. 84* × 10%	13.33Hz	*Pr. 84* × 10%	1r/min	0.01Hz
893	Energy saving monitor reference (motor capacity)	Rated inverter capacity	Motor capacity *(Pr. 80)*				0.01kW/0.1kW *1	
C14 (918)	Terminal 1 gain frequency (speed)	60Hz	2000r/min	*Pr. 84*	133.33Hz	*Pr. 84*	1r/min	0.01Hz

—: The setting does not change.

*1 Initial values differ according to the inverter capacity. (55K or lower/75K or higher)
*2 Setting *Pr. 71 Applied motor* = one of "333, 334, 8093, 8094" does not change the *Pr. 71 Applied motor* setting.
*3 Setting *Pr. 80 Motor capacity* ≠ "9999" does not change the *Pr. 80 Motor capacity* setting.
*4 This parameter can be set when FR-A7NL is mounted.
*5 200r/min when *Pr. 788 Low-speed range torque characteristics* = "0".
*6 13.33Hz when *Pr. 788 Low-speed range torque characteristics* = "0".

REMARKS

If IPM parameter initialization is performed in rotations per minute (*Pr. 998* = "3003" or "8009"), the parameters not listed in the table above are also set and displayed in rotations per minute.

1.3 Offline auto tuning for an IPM motor (motor constant tuning) (Pr.1, Pr.9, Pr.18, Pr.71, Pr.80, Pr.81, Pr.83, Pr.84, Pr.90, Pr.92, Pr.93, Pr.96, Pr.684, Pr.706, Pr.707, Pr.711, Pr.712, Pr.721, Pr.724, Pr.725, Pr.859) PM

The offline auto tuning for an IPM motor enables the optimal operation of an IPM motor.

- What is offline auto tuning?
  Under PM sensorless vector control, setting motor constants automatically (offline auto tuning) enables optimal operation of motors even when motor constants vary or when the wiring distance is long. The offline auto tuning also enables the operation with an IPM motor other than MM-CF.

Parameter Number	Name	Initial Value	Setting Range		Description	
1	Maximum frequency	120/ 60Hz *1	0 to 120Hz		Set the upper limit of the output frequency.	
9	Electronic thermal O/ L relay	Rated inverter current	0 to 500A		Set the rated motor current.	
18	High speed maximum frequency	120/ 60Hz *1	120 to 400Hz		Set when performing the operation at 120Hz or more. (Limited at 300Hz under PM sensorless vector control)	
71	Applied motor	0	0 to 8, 13 to 18, 20, 23, 24, 30, 33, 34, 40, 43, 44, 50, 53, 54, 330, 333, 334, 8093, 8094		Setting a motor type selects its thermal characteristic and the motor constant.	
80	Motor capacity	9999	55K or lower	0.4 to 55kW	Set the applied motor capacity.	
			75K or higher	0 to 3600kW		
			9999		V/F control	
81	Number of motor poles	9999	2, 4, 6, 8, 10		Set the number of motor poles.	
			12, 14, 16, 18, 20		X18 signal-ON:V/F control	Set 10 + number of motor poles.
			9999		V/F control	
83	Rated motor voltage	200/ 400V *2	0 to 1000V		Set the rated motor voltage (V).	
84	Rated motor frequency	60Hz	10 to 300Hz		Set the rated motor frequency (Hz). (Limited at 120Hz when *Pr. 71* is set to a motor other than IPM)	
90	Motor constant (R1)	9999	55K or lower	0 to 50Ω, 9999	Tuning data (The value measured by offline auto tuning is automatically set.) 9999: Motor constant of the MM-CF IPM motor. (Except 9999, the set value is the motor constant.)	
			75K or higher	0 to 400mΩ, 9999		
92	Motor constant (L1)/d-shaft inductance	9999	55K or lower	0 to 50Ω, (0 to 1000mH), 9999		
			75K or higher	0 to 3600mΩ (0 to 400mH), 9999		
93	Motor constant (L2)/q-shaft inductance	9999	55K or lower	0 to 50Ω, (0 to 1000mH), 9999		
			75K or higher	0 to 3600mΩ (0 to 400mH), 9999		
96	Auto tuning setting/ status	0	0		Offline auto tuning is not performed	
			1		Offline auto tuning is performed without motor running (other than MM-CF)	
			11		Offline auto tuning is performed without motor running (MM-CF)	
			101		Offline auto tuning by rotating a general-purpose motor (no tuning during PM sensorless vector control)	

Parameter Number	Name	Initial Value	Setting Range		Description
684	Tuning data unit switchover	0	0		Internal data converted value
			1		Displayed in "A, Ω, mH, %"
706	Induced voltage constant	9999	0 to 5000mV • s/rad		Adjust the constant if the current fluctuates during operation after tuning.
			9999		Constant value calculated based on the tuning data
707	Motor inertia (integer)	9999	10 to 999		Set the motor inertia.
			9999		Uses the inertia of the MM-CF IPM motor
711	Motor d-shaft inductance Ld decay ratio	9999	0 to 100%, 9999		Tuning data (The value measured by offline auto tuning is automatically set.) 9999: Motor constant of the MM-CF IPM motor. (Except 9999, the set value is the motor constant.)
712	Motor q-shaft inductance Lq decay ratio	9999	0 to 100%, 9999		
721	Starting magnetic pole position detection pulse width	9999	0 to 6000μs, 9999		
724	Motor inertia (exponent)	9999	1 to 7		Set the motor inertia.
			9999		Uses the inertia of the MM-CF IPM motor
725	Motor protection current level	9999	0 to 500%		Set the maximum current (OCT) level of the motor (%).
			9999		Uses the maximum current of MM-CF
859	Torque current	9999	55K or lower	0 to 500A	Tuning data (The value measured by offline auto tuning is automatically set.)
			75K or higher	0 to 3600A	
			9999		Uses the constant of the MM-CF IPM motor

*1 Initial values differ according to the inverter capacity. (55K or lower/75K or higher)
*2 The initial value differs according to the voltage level. (200V/400V)

POINT

- The settings are valid only under the PM sensorless vector control.
- When the wiring length between the inverter and the motor is long (30m or longer as a reference), use the offline auto tuning function to drive the motor in the optimum operation characteristic.
- The offline auto tuning enables the operation with an IPM motor other than MM-CF.
- Tuning is enabled even when a load is connected to the motor. (As the load is lighter, tuning accuracy is higher. Tuning accuracy does not change even if the inertia is large.)
- Reading/writing of motor constants tuned by offline auto tuning are enabled. You can copy the offline auto tuning data (motor constants) to another inverter with the PU (FR-DU07/FR-PU07).
- The offline auto tuning status can be monitored with the PU (FR-DU07/FR-PU07/FR-PU04).
- Do not connect a surge voltage suppression filter (FR-ASF-H/FR-BMF-H) to the 55K or lower and sine wave filter (MT-BSL/BSC) to the 75K or higher between the inverter and motor.

(1) Before performing offline auto tuning

Check the following before performing offline auto tuning.

- The PM sensorless vector control should be selected.
- A motor should be connected. Note that the motor should be at a stop at a tuning start.
- The motor capacity should be equal to or one rank lower than the inverter capacity.
- The maximum frequency under PM sensorless vector control should be 300Hz.
- Even if tuning is performed without motor running (*Pr. 96 Auto tuning setting/status* = "11"), the motor may run slightly. Therefore, fix the motor securely with a mechanical brake, or before tuning, make sure that there will be no problem in safety if the motor runs. (Caution is required especially in vertical lift applications). Note that if the motor runs slightly, tuning performance is unaffected.
- Tuning is not available during position control under PM sensorless vector control.

(2) Setting

To perform tuning, set the following parameters about the motor.

Parameter Number	Name	Setting for an IPM motor other than MM-CF	Setting for MM-CF
80	Motor capacity	Motor capacity (kW)	Set by the IPM parameter initialization (Refer to *page 4.*)
81	Number of motor poles	Number of motor poles	
1(18)	Maximum frequency (High speed maximum frequency)	The maximum motor frequency (Hz)	
9	Electronic thermal O/L relay	Rated motor current (A)	
84	Rated motor frequency	Rated motor frequency (Hz)	
83	Rated motor voltage	Rated motor voltage (V)	Rated motor voltage (V) printed on the motor's rating plate.
707	Motor inertia (integer)	Motor inertia Jm = $Pr.707 \times 10^{(-Pr.724)}$ ($kg \cdot m^2$)	9999 (Initial value)
724	Motor inertia (exponent)		
725	Motor protection current level	Maximum current (OCT) level of the motor (%)	9999 (Initial value)
71	Applied motor	8093	333
96	Auto tuning setting/status	1	11

REMARKS

· To perform offline auto tuning on an IPM motor other than MM-CF, contact your sales representative.

(3) Execution of tuning

CAUTION

· Before performing tuning, check the monitor display of the operation panel (FR-DU07) or parameter unit (FR-PU04/ FR-PU07) if the inverter is in the state ready for tuning. (Refer to 2) below) Turning ON the start command while tuning is unavailable starts the motor.

1)When performing PU operation, press FWD/REV on the operation panel.

For External operation, turn ON the start command (STF signal or STR signal). Tuning starts.

REMARKS

· Satisfy the required inverter start conditions to start offline auto tuning. For example, stop the input of MRS signal.

· To force tuning to end, use the MRS or RES signal or press STOP RESET on the operation panel.
(Turning the start signal (STF signal or STR signal) OFF also ends tuning.)

· During offline auto tuning, only the following I/O signals are valid (initial value):
· Input signals <valid signal> STOP, OH, MRS, RT, RES, STF, STR
· Output terminal RUN, OL, IPF, FM, AM, A1B1C1
Note that the progress status of offline auto tuning is output in fifteen steps from AM and FM when speed and output frequency are selected.

· Do not perform ON/OFF switching of the second function selection signal (RT) during execution of offline auto tuning. Auto tuning is not executed properly.

· Setting offline auto tuning (*Pr. 96 Auto tuning setting/status* = "1 or 11") will make pre-excitation invalid.

CAUTION

· Since the RUN signal turns ON when tuning is started, caution is required especially when a sequence which releases a mechanical brake by the RUN signal has been designed.

· When executing offline auto tuning, input the run command after switching ON the main circuit power (R/L1, S/L2, T/L3) of the inverter.

· While *Pr. 79* = "7," turn the X12 signal ON to tune in the PU operation mode.

2)Monitor is displayed on the operation panel (FR-DU07) and parameter unit (FR-PU07/FR-PU04) during tuning as below.

	Parameter Unit (FR-PU07/FR-PU04) Display		Operation Panel (FR-DU07) Display	
Pr. 96 setting	1	11	1	11
(1) Setting	READ:List 1 --- STOP PU	READ:List 11 --- STOP PU		
(2) Tuning in progress	TUNE 2 STF FWD PU	TUNE 12 STF FWD PU		
(3) Normal end	TUNE 3 COMPLETION STF STOP PU	TUNE 13 COMPETION STF STOP PU	 Flickering	 Flickering
(4) Error end (when the inverter protective function is activated)	TUNE ERROR 9 STF STOP PU			

3)When offline auto tuning ends, press STOP RESET of the operation panel during PU operation. For External operation, turn OFF the start signal (STF signal or STR signal).
This operation resets the offline auto tuning and the PU's monitor display returns to the normal indication. (Without this operation, next operation cannot be started.)

REMARKS

- The motor constants measured once in the offline auto tuning are stored as parameters and their data are held until the offline auto tuning is performed again.
- Changing *Pr. 96* setting from "3 or 13" after tuning completion will invalidate the tuning data. In this case, tune again.

4)If offline auto tuning ended in error (see the table below), motor constants are not set.
Perform an inverter reset and restart tuning.

Error Display	Error Cause	Remedy
8	Forced end	Set "1" or "11" in *Pr. 96* and perform tuning again.
9	Inverter protective function operation	Make setting again.
92	Converter output voltage has reached 75% of rated value.	Check for fluctuation of power supply voltage.
93	Calculation error A motor is not connected.	Check the motor wiring and make setting again.

5)When tuning is ended forcibly by pressing STOP RESET or turning OFF the start signal (STF or STR) during tuning, offline auto tuning does not end properly. (The motor constants have not been set.)
Perform an inverter reset and restart tuning.

CAUTION

- An instantaneous power failure occurring during tuning will result in a tuning error.
  After power is restored, the inverter goes into the normal operation mode. Therefore, when STF (STR) signal is ON, the motor runs in the forward (reverse) rotation.
- Any alarm occurring during tuning is handled as in the ordinary mode. Note that even if a retry operation has been set, retry is not performed.
- The set frequency monitor displayed during the offline auto tuning is 0Hz.

⚠ CAUTION

⚠ Note that the motor may start running suddenly.

(4) Utilizing or changing offline auto tuning data

The data measured in the offline auto tuning can be read and utilized or changed.
<Operating procedure>
1)Set *Pr. 71* according to the motor used.

Motor		*Pr. 71* Setting
IPM motor	MM-CF	334
	Other than MM-CF	8094

2) In the parameter setting mode, read the following parameters and set desired values.
The display units of the read motor constants can be changed with *Pr. 684 Tuning data unit switchover*.
Setting *Pr.684* = "1" does not change the parameter settings.

Parameter Number	Name	Setting Increments		Read Value		Setting Range
		Pr.684 = 0	*Pr.684* = 1	*Pr.71* = 334	*Pr.71* = 8094	
90	Motor constant (R1)	Internal data	0.001Ω/ 0.01mΩ *3	Tuned data *1	Tuned data *1	0 to ***, 9999
92	Motor constant (L1)/d-shaft inductance	Internal data	0.1mH/ 0.01mH *3	9999 *2	Tuned data *1	0 to ***, 9999
93	Motor constant (L2)/q-shaft inductance	Internal data	0.1mH/ 0.01mH *3	9999 *2	Tuned data *1	0 to ***, 9999
711	Motor d-shaft inductance Ld decay ratio	Internal data	0.1%	9999 *2	Tuned data *1	0 to ***, 9999
712	Motor q-shaft inductance Lq decay ratio	Internal data	0.1%	9999 *2	Tuned data *1	0 to ***, 9999
721	Starting magnetic pole position detection pulse width	Internal data	1(μs)	9999 *2	Tuned data *1	0 to ***, 9999
859	Torque current	Internal data	0.01A/0.1A *3	Tuned data *1	Tuned data *1	0 to ***, 9999

*1 As the motor constants measured in the offline auto tuning have been converted into internal data (****), refer to the following setting example when making setting:
Setting example To slightly increase *Pr. 90* value (5%)
When *Pr. 90* is displayed "2516",
set 2642, i.e. 2516 × 1.05 = 2641.8, in *Pr. 90* .
(The value displayed has been converted into a value for internal use. Hence, simple addition of a given value to the displayed value has no significance.)
*2 Setting "9999" selects the IPM motor (MM-CF) constant.
*3 Initial values differ according to the inverter capacity. (55K or lower/75K or higher)

If the current fluctuates after tuning, adjust the constant by referring to the induced voltage constant, which can be found in the data sheet.

Parameter Number	Name	Setting Range	Setting Increments	Initial Setting
706	Induced voltage constant	0 to 5000, 9999	0.1(mV/(rad/s))	9999 *

* Setting "9999" sets a calculated value based on tuning.

1.4 Applied motor (Pr. 71)

Setting of the used motor selects the thermal characteristic appropriate for the motor.
Setting is necessary when using a constant-torque motor. Thermal characteristic of the electronic thermal relay function suitable for the motor is set.
When PM sensorless vector control is selected, the motor constants (MM-CF etc.) necessary for control are selected as well.

Parameter Number	Name	Initial Value	Setting Range	Description
71	Applied motor	0	0 to 8, 13 to 18, 20, 23, 24, 30, 33, 34, 40, 43, 44, 50, 53, 54**, 330, 333, 334, 8093, 8094**	Selecting the standard motor or constant-torque motor sets the corresponding motor thermal characteristic.

(1) Set the motor to be used

Refer to the following list and set this parameter according to the motor used.

Pr. 71 Setting	Motor		Electronic thermal relay function operation characteristic	
			Constant torque	IPM
330*	IPM Motor MM-CF			○
333*	IPM Motor MM-CF	Select "offline auto tuning setting"		○
8093	IPM Motor (other than MM-CF)		○	
334*	IPM Motor MM-CF	Auto tuning data can be read, changed, and set		○
8094	IPM Motor (other than MM-CF)		○	

* The setting is available for FR-A720-11K or lower.

REMARKS

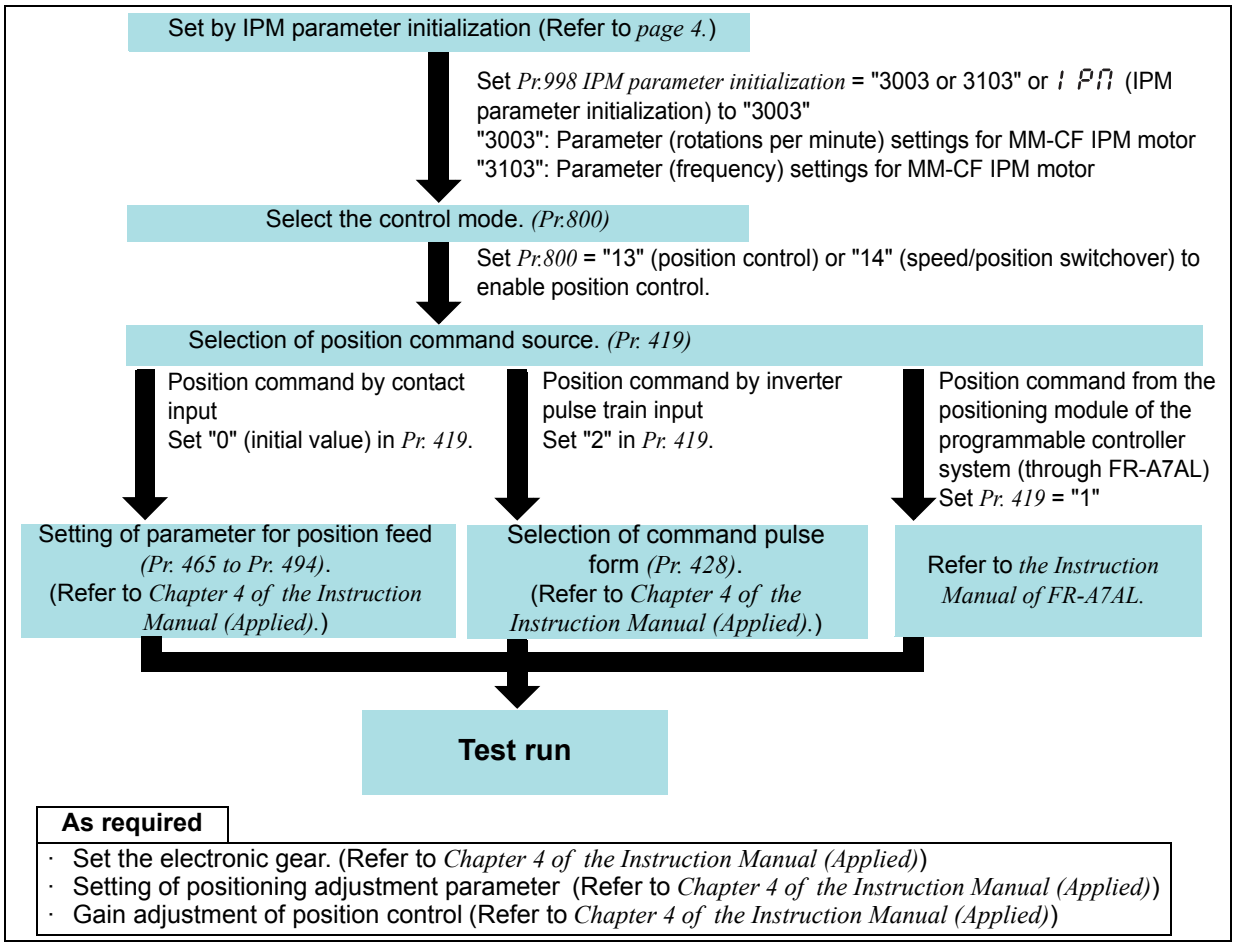
- When performing offline auto tuning, set "3, 7, 8, 13, 17, 18, 23, 33, 43, 53, 333, 8093" in *Pr. 71*.
  (Refer to *page 7* for offline auto tuning)
- For the 5.5K and 7.5K, the *Pr. 0 Torque boost* and *Pr. 12 DC injection brake operation voltage* settings are automatically changed according to the *Pr. 71* setting as follows.

Pr.71	Standard Motor Setting **0, 2, 3 to 8, 20, 23, 24, 40, 43, 44, 330, 333, 334, 8093, 8094**	Constant Torque Motor Setting **1, 13 to 18, 50, 53, 54**
Pr. 0	3%	2%
Pr. 12	4%	2%

1.5 Position control under PM sensorless vector control (Pr.800) PM

- In position control, speed commands, which are calculated to eliminate the difference between the command pulse (parameter setting) and the estimated feedback pulse, are output to rotate the motor.
- This inverter can perform simple position feed by contact input, position control by inverter simple pulse input, and position control by FR-A7AL pulse train input.

(1) Setting procedure



CAUTION

- The carrier frequency is limited during PM sensorless vector control. (Refer to page 16.)
- Position deviation may occur due to motor temperature changes. In such case, shut off the inverter outputs, and restart.
- The Z-phase outputs cannot be made under PM sensorless vector control. When *Pr.419* = "1" is set to send positioning commands in pulses via a programmable controller positioning module and FR-A7AL, use the home position return operation that does not require Z-phase signals.

(2) Select the control method

Pr.998	*Pr.998* Setting	Control Method	Control Type	Remarks
3003, 3103 (MM-CF)	Other than 9, 13, 14	PM sensorless vector control	Speed control	—
	9		Test operation	—
	13		Position control	—
	14		Speed control/position control switchover	MC signal ON: position control MC signal OFF: speed control

REMARKS

- Perform position control under PM sensorless vector control only when using an MM-CF IPM motor. Moreover, perform it only when the high frequency superposition control is selected. (*Pr.788* = "9999 (initial value)")
- Position control is performed on the assumption of 4096 pulses/motor rotation. The positioning accuracy is 200 pulses/rev for 1.5K or lower, and 100 pulses/rev for 2K or higher (under no load).

Refer to *Chapter 4 of the Instruction Manual (Applied)* for the detail of the position control.

1.6 Low-speed range torque characteristics (Pr.788) PM

Torque characteristics in a low-speed range can be changed.

Parameter Number	Name	Initial Setting	Setting Range	Operation
788 PM	Low-speed range torque characteristics	9999	0	Disables the low-speed range torque characteristic (current synchronization operation).
			9999*	Enables the low-speed range torque characteristic (high frequency superposition control)

* Current synchronization operation is always performed for IPM motors other than MM-CF, even if "9999" is set.

(1) When the low-speed range torque characteristic is enabled ("9999" (initial value))

- The high frequency superposition control provides enough torque in the low-speed range operation.
- Refer to *page 17* for the torque characteristics.

(2) When the low-speed range torque characteristic is disabled ("0")

- The current synchronization operation reduces much motor noise compared with the high frequency superposition control.
- The torque in a low-speed range is low. Use this setting for an operation with light start-up load.
- Refer to *page 17* for the torque characteristics.

REMARKS

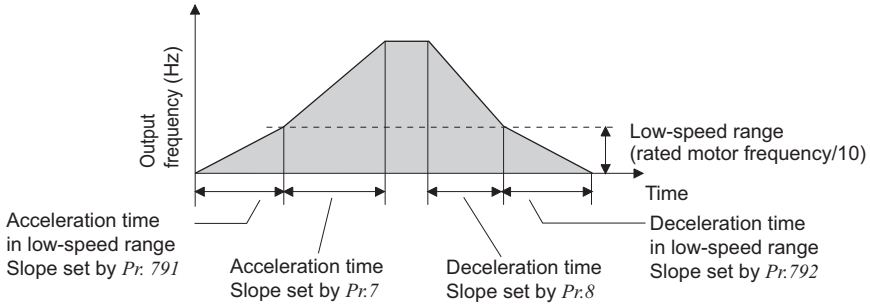
- Position control under PM sensorless vector control is not available when the current synchronization operation is selected.

1.7 Setting the acceleration/deceleration time in the low-speed range (Pr.791, Pr.792) PM

Parameter Number	Name	Initial Value	Setting Range	Description
791 PM	Acceleration time in low-speed range	9999	0 to 3600/360s*	Set the acceleration time in a low-speed range (less than 1/10 of the rated motor frequency).
			9999	The acceleration time set in *Pr.7* is applied. (When the second functions are enabled, the settings are applied.)
792 PM	Deceleration time in low-speed range	9999	0 to 3600/360s*	Set the deceleration time in a low-speed range (less than 1/10 of the rated motor frequency).
			9999	The deceleration time set in *Pr.8* is applied. (When the second functions are enabled, the settings are applied.)

* Depends on the *Pr. 21 Acceleration/deceleration time increments* setting. The initial value for the setting range is "0 to 3600s" and the setting increments is "0.1s".

If torque is required in a low-speed range (less than 1/10 of the rated motor frequency), set *Pr.791 Acceleration time in low-speed range* and *Pr.792 Deceleration time in low-speed range* settings higher than the *Pr.7 Acceleration time* and *Pr.8 Deceleration time* settings so that the mild acceleration/deceleration is performed in the low-speed range. (For an operation with second acceleration/deceleration times, set the acceleration/deceleration times longer than the second acceleration/deceleration times.)



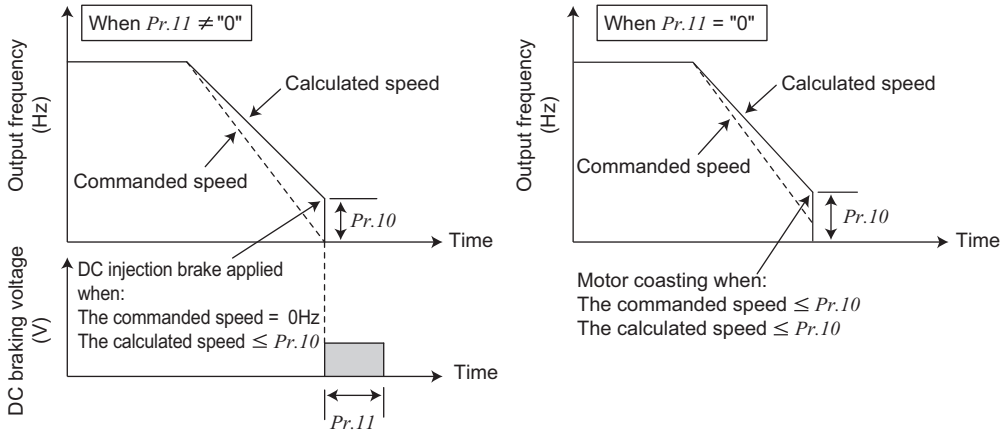
REMARKS

- Set *Pr.791* higher than *Pr.7*, and *Pr.792* higher than *Pr.8*. If set as *Pr.791* < *Pr.7*, the operation is performed as *Pr.791* = *Pr.7*. If set as *Pr.792* < *Pr.8*, the operation is performed as *Pr.792* = *Pr.8*.
- Refer to *page 6* for the rated motor frequency of MM-CF.

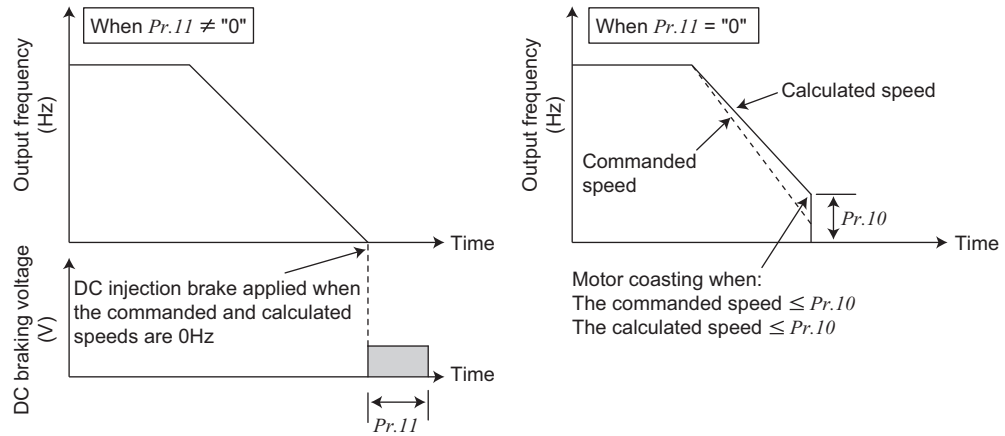
1.8 DC injection brake of the PM sensorless vector control PM

DC injection brake under PM sensorless vector control is performed as below.

<High frequency superposition control (Pr.788 = "9999 (initial value)")>



<Current synchronization operation Pr.788 = "0">



REMARKS

- The X13 signal is disabled during PM sensorless vector control.

1.9 PM sensorless vector control specification

Item	Specification	
Control method	Sensorless vector control Low-speed range: Control method in a low-speed range can be selected by parameter (high frequency superposition control (initial setting) / current synchronization operation)	
Starting torque	High frequency superposition control	200% (1.5kW or lower with MM-CF: 200%, 2.0kW or higher: 150%)
	Current synchronization operation	50%
Speed control range	High frequency superposition control	1:1000 (Use a one rank higher inverter for the ratio of 1:1000)
	Current synchronization operation	1:10
Zero speed	High frequency superposition control	Possible (Use a one rank higher inverter for zero-speed 200%)
	Current synchronization operation	Not available
Carrier frequency	High frequency superposition control	6kHz (*Pr.72* = "0 to 9"), 10kHz (*Pr.72* = "10 to 13"), 14kHz (*Pr.72* = "14, 15") (6kHz in a low-speed range of 10kHz or higher. 2kHz is not selectable.)
	Current synchronization operation	2kHz (*Pr.72* = "0 to 5"), 6kHz (*Pr.72* = "6 to 9"), 10kHz (*Pr.72* = "10 to 13"), 14kHz (*Pr.72* = "14, 15") (6kHz in a low-speed range of 10kHz or higher.)
Position control	High frequency superposition control	Possible
	Current synchronization operation	Not available
Offline auto tuning for an IPM motor	Possible	
Applicable motor	Mitsubishi MM-CF series IPM motors (0.5 to 7.0kW) IPM motors other than MM-CF (tuning required) (no capacity limit) *	

* To perform PM sensorless vector control on an IPM motor other than MM-CF, contact your sales representative.

1.10 Motor specification

(1) Specifications

Item \ Motor		2000r/min Series						
		MM-CF 52(C)(B)	MM-CF 102(C)(B)	MM-CF 152(C)(B)	MM-CF 202(C)(B)	MM-CF 352(C)(B)	MM-CF 502(C)	MM-CF 702(C)
Compatible inverter	FR-A720-☐	0.4K	0.75K	1.5K	2.2K	3.7K	5.5K	7.5K
		0.75K *6	1.5K *6	2.2K *6	3.7K *6	5.5K *6	7.5K *6	11K *6
Continuous characteristics *1	Rated output [kW]	0.5	1.0	1.5	2.0	3.5	5.0	7.0
	Rated torque [N•m]	2.39	4.78	7.16	9.55	16.70	23.86	33.41
Rated speed *1 [r/min]		2000						
Max. speed [r/min]		3000						
Instantaneous permissible speed [r/min]		3450						
Max. torque [N•m]		4.78	9.56	14.32	19.09	33.41	47.73	66.82
Inertia moment J *5 [$\times 10^{-4}$kg•m^2]		6.6 (7.0)	13.7 (14.9)	20.0 (21.2)	45.5 (48.9)	85.6 (89.0)	120.0	160.0
Recommended ratio of load inertia moment to motor shaft inertia moment *2		100 times max.			50 times max.			
Rated current [A]		1.81	3.70	5.22	7.70	12.5	20.5	27.0
Insulation rank		Class F						
Structure		Totally-enclosed, self-cooling (protective system:IP44 *3, IP65 *3, *4)						

Item	Motor	2000r/min Series						
		MM-CF 52(C)(B)	MM-CF 102(C)(B)	MM-CF 152(C)(B)	MM-CF 202(C)(B)	MM-CF 352(C)(B)	MM-CF 502(C)	MM-CF 702(C)
Environmental conditions	Surrounding air temperature and humidity	-10C° to +40C° (non-freezing) • 90%RH or less (non-condensing)						
	Storage temperature and humidity	-20C° to +70C° (non-freezing) • 90%RH or less (non-condensing)						
	Ambience	Indoors (no direct sunlight), free from corrosive gas, flammable gas, oil mist, dust and dirt						
	Altitude	Max. 1000m above sea level						
	Vibration	X: 9.8m/s^2, Y: 24.5m/s^2						
Mass *5 [kg]		5.1 (7.8)	7.2 (11)	9.3 (13)	13 (20)	19 (28)	27	36

*1 When the power supply voltage drops, we cannot guarantee the above output and rated speed.

*2 When the load torque is 20% of the motor rating. The permissible load inertia moment ratio is smaller when the load torque is larger. Consult us if the load inertia moment ratio exceeds the above value.

*3 This does not apply to the shaft through portion.

*4 Value for MM-CF□2C.

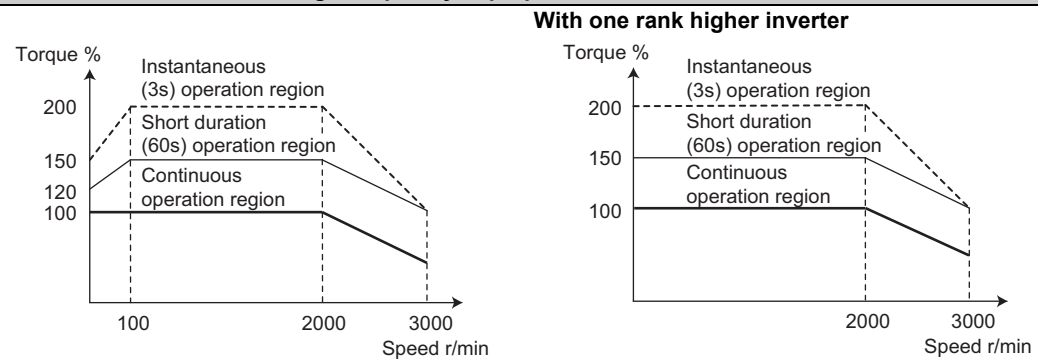
*5 The value for MM-CF□2B is indicated in parentheses.

*6 Applicable one-rank higher inverters for the lifted low-speed range torque operation.

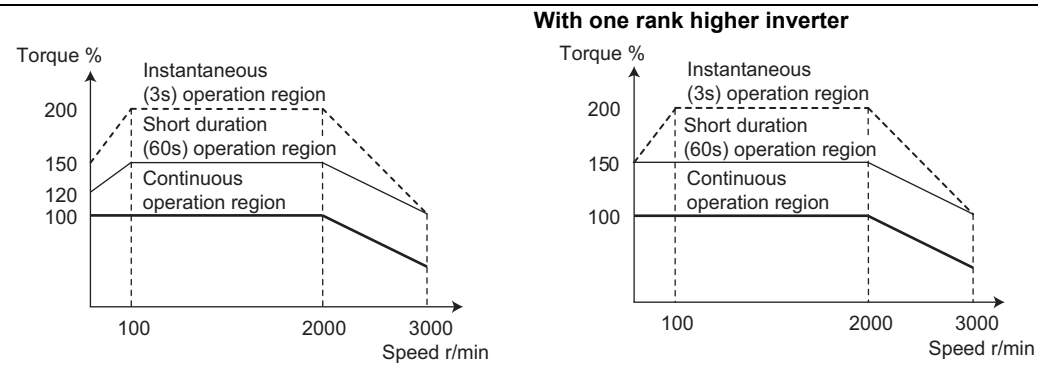
(2) Torque characteristics

Under high frequency superposition control

MM-CF 1.5kW or lower



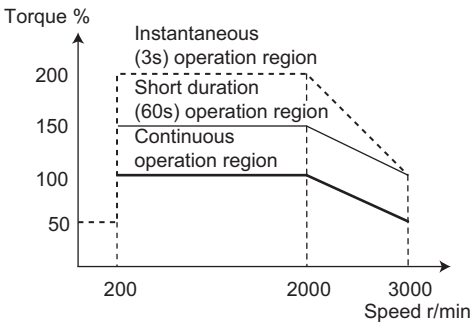
MM-CF 2.0kW or higher



* Zero speed up to a 150% instantaneous output torque

During current synchronization operation

MM-CF all capacities



2 Voltage reduction selection during stall prevention operation (Pr.154)

The setting values "10 and 11" are added for *Pr.154 Voltage reduction selection during stall prevention operation*.

Parameter Number	Name	Initial Value	Setting Range	Description	
154 V/F Magnetic flux	Voltage reduction selection during stall prevention operation	1	0	With voltage reduction	You can select whether to use output voltage reduction during stall prevention operation or not.
			1	Without voltage reduction	
			10	With voltage reduction	Use these settings when the overvoltage protective function (E.OV□) activates during stall prevention operation in an application with large load inertia.
			11	Without voltage reduction	

(1) To further prevent a trip *(Pr. 154)* V/F Magnetic flux

· When *Pr. 154* is set to "0**, 10**", the output voltage reduces during stall prevention operation. By making this setting, an overcurrent trip becomes less likely to occur. Use this function when torque reduction does not pose a problem.

- **Set *Pr.154* = "10, 11" when the overvoltage protective function (E.OV□) activates during stall prevention operation in an application with large load inertia. Note that turning OFF the start signal (STF/STR) or varying the frequency signal during stall prevention operation may delay the acceleration/deceleration start.**

(2) Causes and corrective actions

Operation Panel Indication	E.OV1		FR-PU04 FR-PU07	OV During Acc
Name	Regenerative overvoltage trip during acceleration			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system.			
Check point	· Check for too slow acceleration. (e.g. during descending acceleration with lifting load) · Check if *Pr.22 Stall prevention operation level* is set too low like the no-load current. • **Check if the stall prevention operation is frequently activated in an application with a large load inertia.**			
Corrective action	· Decrease the acceleration time. · Use the regeneration avoidance function *(Pr. 882 to Pr. 886)*. (📖 Refer to *Chapter 4 of the Instruction Manual (Applied).*) · Set a value larger than the no load current in *Pr. 22 Stall prevention operation level*. • **Set *Pr.154 Voltage reduction selection during stall prevention operation* = "10 or 11". (📖 Refer to *Chapter 4 of the Instruction Manual (Applied).*)**			

Operation Panel Indication	E.OV2		FR-PU04 FR-PU07	Stedy Spd OV
Name	Regenerative overvoltage trip during constant speed			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system.			
Check point	· Check for sudden load change. · Check if *Pr.22 Stall prevention operation level* is set too low like the no-load current. • **Check if the stall prevention operation is frequently activated in an application with a large load inertia.**			
Corrective action	· Keep load stable. · Use the regeneration avoidance function *(Pr. 882 to Pr. 886)*. (📖 Refer to *Chapter 4 of the Instruction Manual (Applied).*) · Use the brake unit or power regeneration common converter (FR-CV) as required. · Set a value larger than the no load current in *Pr. 22 Stall prevention operation level.* • **Set *Pr.154 Voltage reduction selection during stall prevention operation* = "10 or 11". (📖 Refer to *Chapter 4 of the Instruction Manual (Applied).*)**			

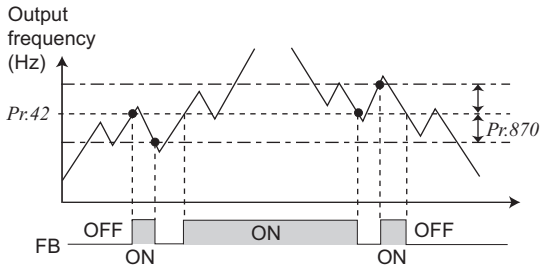
Operation Panel Indication	E.OV3	E.0u3	FR-PU04 FR-PU07	OV During Dec
Name	Regenerative overvoltage trip during deceleration or stop			
Description	If regenerative energy causes the inverter's internal main circuit DC voltage to reach or exceed the specified value, the protective circuit is activated to stop the inverter output. The circuit may also be activated by a surge voltage produced in the power supply system.			
Check point	· Check for sudden speed reduction. • **Check if the stall prevention operation is frequently activated in an application with a large load inertia.**			
Corrective action	· Increase the deceleration time. (Set the deceleration time which matches the moment of inertia of the load) · Set the brake cycle longer. · Use the regeneration avoidance function *(Pr. 882 to Pr. 886)*. (📖 Refer to *Chapter 4 of the Instruction Manual (Applied).*) · Use the brake unit or power regeneration common converter (FR-CV) as required. • **Set *Pr.154 Voltage reduction selection during stall prevention operation* = "10 or 11". (📖 Refer to *Chapter 4 of the Instruction Manual (Applied).*)**			

3 Speed detection hysteresis (Pr.870)

This function prevents chattering of the speed detection signals.

Parameter Number	Name	Initial Value	Setting Range	Description
870	Speed detection hysteresis	0Hz*	0 to 5Hz	Set the hysteresis width for the detected frequency.

* Performing IPM parameter initialization changes the settings. (Refer to *page 6*)



Example of the speed detection (FB) signal

· When an output frequency fluctuates, the following signals may repeat ON/OFF (chatters).
  · Up to frequency (SU)
  · Speed detection (FB, FB2, FB3)
  · Low speed output (LS)

  Setting hysteresis to the detected frequency prevents chattering of these signals.

REMARKS

· Setting a higher value to this parameter slows the response of frequency detection signals (SU, FB, FB2, FB3, and LS).
· The ON/OFF logic for the LS signal is opposite for the FB signal.

4 Limit regeneration avoidance operation frequency (Pr. 885)

The setting range of *Pr.885 Regeneration avoidance compensation frequency limit value* has been changed.

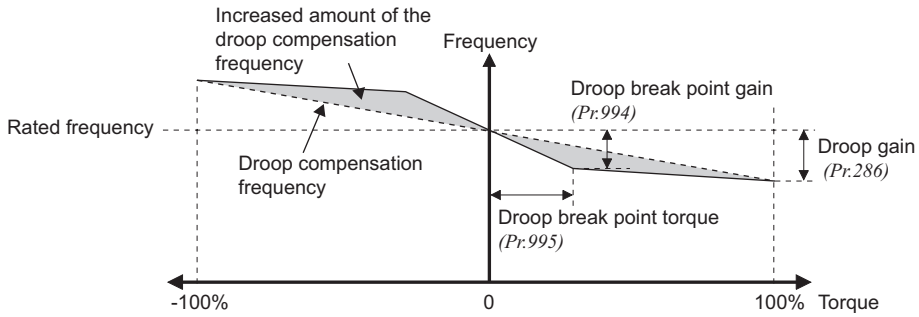
Parameter Number	Name	Initial Value	Setting Range	Description
885	**Regeneration avoidance compensation frequency limit value**	6Hz	0 to 30Hz	Set the limit value of frequency which rises at activation of regeneration avoidance function.
			9999	Frequency limit invalid

5 Break point setting for droop control (Pr.994, Pr.995)

Magnetic flux Sensorless Vector P M

Set *Pr.994* and *Pr.995* to have a break point on a droop compensation frequency line. Setting a break point allows the inverter to raise the droop compensation frequency for light-load (no load) operation without raising it for heavy-load operation.

Parameter Number	Name	Initial Value	Setting Range	Description
994	**Droop break point gain**	9999	0.1 to 100%	Set the changing droop amount as a percentage value of the rated motor frequency.
			9999	No function
995	**Droop break point torque**	100%	0.1 to 100%	Set the torque where the droop amount is changed.



CAUTION

The droop break point function is disabled when any of the following conditions is met. (Linear compensation by *Pr.286* is performed.)

- *Pr.995* = "100% (initial value)"
- *Pr.286* < *Pr.994*
- *Pr.994* ≤ *Pr.995* × *Pr.286* / 100%

6 Setting multiple parameters as a batch (Pr.999)

- Parameter settings are changed as a batch. Those include communication parameter settings for the Mitsubishi human machine interface (GOT) connection, rated frequency settings of 50Hz/60Hz, and acceleration/deceleration time increment settings.
- Multiple parameters are changed automatically. Users do not have to consider each parameter number. (Automatic parameter setting mode)

Parameter Number	Name	Initial Value	Setting Range	Description
999 *1	**Automatic parameter setting**	9999 *2	10	GOT initial setting (PU connector)
			11	GOT initial setting (RS-485 terminals)
			20	50Hz rated frequency
			21	60Hz rated frequency
			30	Acceleration/deceleration time (0.1s increment)
			31	Acceleration/deceleration time (0.01s increment)
			9999	No action

*1 This parameter allows its setting to be changed in any operation mode even if "0 (initial value)" is set in *Pr. 77 Parameter write selection*.
*2 The read value is always "9999."

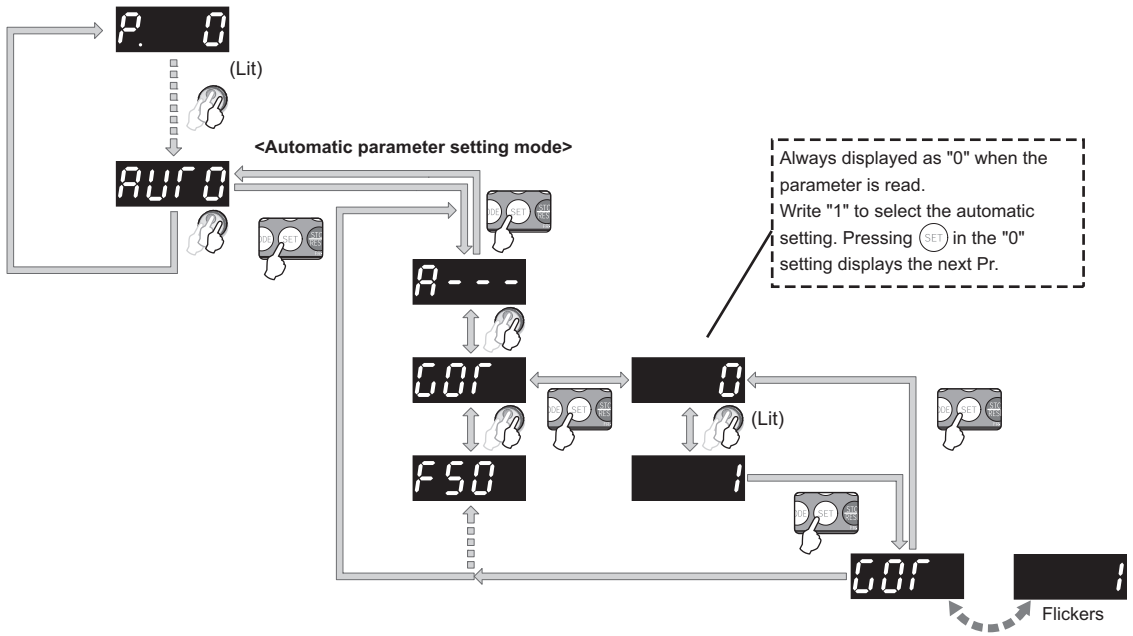
(1) Automatic parameter setting *(Pr.999)*

- Select which parameters to be automatically set, and set that to *Pr. 999*. Multiple parameter settings are changed automatically. Refer to *page 22* for the list of parameters that are changed automatically.

Pr.999 setting	Description		Operation in the automatic parameter setting mode
10	Automatically sets the communication parameters for the GOT connected with a PU connector		AUTO (AUTO) → GOT (GOT) → Write "1"
11	Automatically sets the communication parameters for the GOT connected with RS-485 terminals		—
20	50Hz rated frequency	Sets the related parameters of the rated frequency according to the power supply frequency	AUTO (AUTO) → F50 (F50) → Write "1"
21	60Hz rated frequency		—
30	0.1s increment	Changes the setting increments of acceleration/deceleration time parameters without changing acceleration/deceleration settings	—
31	0.01s increment		AUTO (AUTO) → T0.01 (T0.01) → Write "1"

REMARKS

If the automatic setting is performed, the selected settings including the changed parameter settings will be changed.



(2) List of automatically-set parameters

The following tables show which parameters are changed in each of the automatic parameter settings.

CAUTION

· If the automatic setting is performed with *Pr.999* or the automatic parameter setting mode, the listed settings including the changed parameter settings (changed from the initial setting) will be automatically changed. Before performing the automatic setting, confirm that changing the listed parameters will not cause any problem.

· GOT initial setting (PU connector) (*Pr.999* = "10")

Parameter	Name	Initial value	Automatically set to	Refer to
79	**Operation mode selection**	0	1	*Chapter 4 of the Instruction Manual (Applied)*
118	**PU communication speed**	192	192	
119	**PU communication stop bit length**	1	10	
120	**PU communication parity check**	2	1	
121	**Number of PU communication retries**	1	9999	
122	**PU communication check time interval**	9999	9999	
123	**PU communication waiting time setting**	9999	0ms	
124	**PU communication CR/LF selection**	1	1	
340	**Communication startup mode selection**	0	0	

REMARKS

Always perform an inverter reset after the initial setting.

· GOT initial setting (RS-485 terminals) (*Pr.999* = "11")

Parameter	Name	Initial value	Automatically set to	Refer to
79	**Operation mode selection**	0	0	*Chapter 4 of the Instruction Manual (Applied)*
332	**RS-485 communication speed**	96	192	
333	**RS-485 communication stop bit length**	1	10	
334	**RS-485 communication parity check selection**	2	1	
335	**RS-485 communication retry count**	1	9999	
336	**RS-485 communication check time interval**	0s	9999	
337	**RS-485 communication waiting time setting**	9999	0ms	
340	**Communication startup mode selection**	0	1	
341	**RS-485 communication CR/LF selection**	1	1	
549	**Protocol selection**	0	0	

REMARKS

Always perform an inverter reset after the initial setting.

· Rated frequency (*Pr. 999* = "20(50Hz), 21(60Hz)")

Parameter	Name	Initial value	*Pr.999* = "21"	*Pr.999* = "20" Automatic parameter setting	Refer to
3	Base frequency	60Hz	60Hz	50Hz	*Chapter 4 of the Instruction Manual (Applied)*
4	Multi-speed setting (high speed)	60Hz	60Hz	50Hz	
20	Acceleration/deceleration reference frequency	60Hz	60Hz	50Hz	
37	Speed display	0	0		
55	Frequency monitoring reference	60Hz	60Hz	50Hz	
66	Stall prevention operation reduction starting frequency	60Hz	60Hz	50Hz	
116	Third output frequency detection	60Hz	60Hz	50Hz	
125 (903)	Terminal 2 frequency setting gain frequency	60Hz	60Hz	50Hz	
126 (905)	Terminal 4 frequency setting gain frequency	60Hz	60Hz	50Hz	
263	Subtraction starting frequency	60Hz	60Hz	50Hz	
266	Power failure deceleration time switchover frequency	60Hz	60Hz	50Hz	
386	Frequency for maximum input pulse	60Hz	60Hz	50Hz	
390*	% setting reference frequency	60Hz	60Hz	50Hz	*FR-A7NL manual*
505	Speed setting reference	60Hz	60Hz	50Hz	*Chapter 4 of the Instruction Manual (Applied)*
808	Forward rotation speed limit	60Hz	60Hz	50Hz	
C14 (918)	Terminal 1 gain frequency (speed)	60Hz	60Hz	50Hz	

* This parameter can be set when the option FR-A7NL is mounted.

· Acceleration/deceleration time increment (*Pr.999* = "30(0.1s) or 31(0.01s)")

Parameter	Name	Initial set increment	*Pr.999* = "30"	*Pr.999* = "31" Automatic parameter setting	Refer to
7	Acceleration time	0.1s	0.1s	0.01s	*Chapter 4 of the Instruction Manual (Applied)*
8	Deceleration time	0.1s	0.1s	0.01s	
16	Jog acceleration/deceleration time	0.1s	0.1s	0.01s	
21	Acceleration/deceleration time increments	1	0 *	1 *	
44	Second acceleration/ deceleration time	0.1s	0.1s	0.01s	
45	Second deceleration time	0.1s	0.1s	0.01s	
110	Third acceleration/ deceleration time	0.1s	0.1s	0.01s	
111	Third deceleration time	0.1s	0.1s	0.01s	
264	Power-failure deceleration time 1	0.1s	0.1s	0.01s	
265	Power-failure deceleration time 2	0.1s	0.1s	0.01s	
791	Acceleration time in low-speed range	0.1s	0.1s	0.01s	
792	Deceleration time in low-speed range	0.1s	0.1s	0.01s	

* The set value is changed for *Pr. 21*.

REMARKS

· When a parameter is set as the acceleration/deceleration time (0.1s), the 0.01s increment is dropped.
· When a parameter is set as the acceleration/deceleration time (0.01s), the parameters are limited at the maximum value of the parameter setting range. For example, *Pr.7* = "361.0s" when 0.1s increment is selected, and *Pr.7* = "360.00s" when 0.01s increment is selected.

7 SERIAL number check

The description on this supplemental sheet applies to the inverters that are manufactured in June 2012 or later and have the following SERIAL or later on their rating plates. Check the SERIAL of your inverter (printed on its rated plate) against the list of SERIAL numbers shown below.

Inverter Model	Symbol
FR-A720-0.4K	B
FR-A720-0.75K	B
FR-A720-1.5K	E
FR-A720-2.2K	E
FR-A720-3.7K	D
FR-A720-5.5K	C
FR-A720-7.5K	C
FR-A720-11K	H
FR-A720-15K	E
FR-A720-18.5K	E
FR-A720-22K	E
FR-A720-30K	B
FR-A720-37K	A
FR-A720-45K	A
FR-A720-55K	Z
FR-A720-75K	B
FR-A720-90K	B

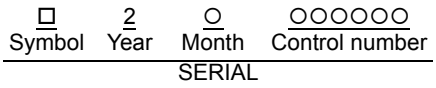
Inverter Model	Symbol
FR-A740-0.4K	L
FR-A740-0.75K	K
FR-A740-1.5K	K
FR-A740-2.2K	L
FR-A740-3.7K	L
FR-A740-5.5K	J
FR-A740-7.5K	J
FR-A740-11K	N
FR-A740-15K	N
FR-A740-18.5K	L
FR-A740-22K	L
FR-A740-30K	G
FR-A740-37K	H
FR-A740-45K	H
FR-A740-55K	H
FR-A740-75K	H
FR-A740-90K	H

Inverter Model	Symbol
FR-A740-110K	L
FR-A740-132K	K
FR-A740-160K	H
FR-A740-185K	H
FR-A740-220K	G
FR-A740-250K	G
FR-A740-280K	G
FR-A740-315K	G
FR-A740-355K	G
FR-A740-400K	D
FR-A740-450K	D
FR-A740-500K	D

● SERIAL number check

Refer to the inverter manual for the location of the rating plate.

Rating plate example



The SERIAL consists of one symbol, two characters indicating production year and month, and six characters indicating control number.
The last digit of the production year is indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December.)

FR-V500, A700, A701 Series
Instruction Manual Supplement

When installing a thermal relay to the cooling fan of the vector-control dedicated motors (SF-V5RU), use the following recommended thermal relay settings.

●200V class (Mitsubishi dedicated motor [SF-V5RU (1500r/min series)])

Motor type SF-V5RU□□K		1	2	3	5	7	11	15	18	22	30	37	45	55
Cooling fan (with thermal protector)*2*3	Voltage	Single-phase 200V/50Hz Single-phase 200V to 230V/60Hz					Three-phase 200V/50Hz Three-phase 200 to 230V/60Hz							
	Input *1	36/55W (0.26/0.32A)			22/28W (0.11/0.13A)		55/71W (0.37/0.39A)				100/156W (0.47/0.53A)			85/130W (0.46/0.52A)
	Thermal relay settings	0.36A			0.18A		0.51A				0.69A			0.68A

●400V class (Mitsubishi dedicated motor [SF-V5RUH (1500r/min series)])

Motor type SF-V5RUH□□K		1	2	3	5	7	11	15	18	22	30	37	45	55
Cooling fan (with thermal protector)*2*3	Voltage	Single-phase 200V/50Hz Single-phase 200V to 230V/60Hz					Three-phase 380 to 400V/50Hz Three-phase 400 to 460V/60Hz							
	Input *1	36/55W (0.26/0.32A)			22/28W (0.11/0.13A)		55/71W (0.19/0.19A)				100/156W (0.27/0.30A)			85/130W (0.23/0.26A)
	Thermal relay settings	0.36A			0.18A		0.25A				0.39A			0.34A

*1 Power (current) at 50Hz/60Hz.

*2 The cooling fan is equipped with a thermal protector. The cooling fan stops when the coil temperature exceeds the specified value in order to protect the fan motor. A restrained cooling fan or degraded fan motor insulation may causes the rise in coil temperature. The fan motor re-starts when the coil temperature drops to normal.

*3 The voltage and input values are the standard specifications of the cooling fan in free air. When the cooling fan is used with a motor, it requires more energy to perform its work, and thus the above input values become slightly larger. The cooling fan can, however, be used as it is without causing problems. When a thermal relay is to be prepared at the customer's side, use the recommended thermal relay settings.

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MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: TOKYO BUILDING 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

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